SEPIC

Support to Enhance Privatization, Investment, and Competitiveness in the Water Sector of the Romanian Economy

Toward Setting Water- and Wastewater-Related Contributions and Penalties in Romania

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and
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Executive Summary

USAID's SEPIC[*] project includes a component aimed at supporting the Administratia Nationala "Apele Romane" (ANAR) to prepare for Romania's accession to the European Union. This report was prepared under that component.

Romanian Water Law 107/1996 was amended by Law 310/2004 in order to fully harmonize it with the EU's Water Framework Directive (WFD). Among other things, the new Water Law untied raw water price increases from the Consumer Price Index, allowing ANAR to set prices that would enable the organization to be sustainable. SEPIC is assisting ANAR to develop new water tariffs and pollution charges as part of the process of implementing the new Water Law and its secondary legislation. This report is intended to provide support to ANAR for setting contributions and making strategic decisions regarding externalization of assets and activities, as Romania moves toward EU accession.

A Financial Model for ANAR

ANAR is facing important issues in adjusting its price policies. This report is largely built around a financial model that supports strategic decision-making by ANAR regarding its water tariffs and pollution charges. The spreadsheets in the model compare revenues from water tariffs and pollution charges generated under the present tariff structure with pertinent ANAR expenditures under various policy alternatives. The various policy alternatives are represented by different "scenarios" defined for analysis purposes. The output of the model is adjustments in water tariffs and pollution charges needed to cover costs incurred under the different policy scenarios.

The model is based on 2003 data provided by ANAR and the two river basin directorates that served as pilots for this work, Arges-Vedea and Siret.

Policy and Pricing Alternatives: Recommendations and Observations

In this report we have addressed four major policy issues in four sets of scenarios, summarized below. Since the assumptions and recommendations associated with these scenarios are meant to support future decision-making, including decision-making regarding legislation, they do not necessarily reflect the legal framework currently in force. Working exercises with the model have shown that it can be used effectively to assess the revenue and cost implications of any policy decision ANAR may wish to consider, not just the four discussed here.

Under the new terminology, prices for water and pollution are referred to as "contributions," and that is the meaning of the term as it is used below.

Issue #1: Cost Recovery: *How would meeting all required operation, maintenance, and rehabilitation costs, including maintenance and rehabilitation work backlog and contributing to capital costs, impact ANAR's cash flow and tariffs?*

[*] "Support to Enhance Privatization, Investment, and Competitiveness in the Water Sector of the Romanian Economy"

The main conclusions and recommendations from running different cost recovery scenarios are the following:

- In order to fully cover ANAR's present water supply costs, water contributions should be increased, from a minimal increase of 11% for irrigation water extracted from surface sources, to a maximal increase of 16% for surface water used in thermal energy production.
- In order to cover water quality "management" (monitoring) costs, pollution contributions would need to increase 29%.
- Should ANAR be required to take over investments currently funded from the state budget, contributions would need to increase by up to 166%. If the government in fact decides to shift these costs to ANAR, we recommend that it be done over a period of ten years, to avoid a sudden extreme tariff increase.

Issue #2: Externalization: *How will externalization affect ANAR's cash flow and tariffs?*

The main conclusions and recommendations from running different externalization scenarios are the following:

- As a first step ANAR needs to carefully define the national-level objectives it wants to achieve through externalization, followed by the same exercise at the river basin level.
- Minor externalization leads to tariff increases of a maximum 23.5%, which is higher than the maximum 16% tariff increase required to cover full maintenance costs without externalization (see the findings for Issue #1, cost recovery, above). More extensive externalization would definitely reduce costs to a level requiring an increase in water contributions well below the 11-16% otherwise required for full cost recovery.
- Some externalization alternatives, such as concessions, may generate additional revenue for ANAR. However, properly executing such concessions requires major efforts and time-consuming procedures, and therefore this course should be very carefully analyzed before taking any decision.

Issue #3: Price Differentials: *How would adjustments in price differentials among different users and among water sources with different water quality impact ANAR's cash flow and tariffs?*

The idea suggested in this report is that a 4% risk component in tariffs would offset ANAR's exposure to lack of cash from uncollected revenue. The contribution paid by bad customers should be higher than that paid by good customers. Including the risk component in the tariff would motivate users to promptly pay their bills and enhance collection.

Since for the present ANAR intends to maintain its current single-tariff approach (the structure of levels of water contributions applied uniformly in all eleven river basins), we include below, for ANAR's future consideration, a summary of arguments in favor of and against this approach. These arguments are excerpted from a US nationwide review of water pricing policies.

Arguments in Favor of Single-Tariff Pricing	Arguments Against Single-Tariff Pricing
• Mitigates rate shock to utility customers • Lowers administrative costs to the utilities • Provides incentives for utility regionalization and consolidation • Physical interconnection is not considered a prerequisite • Addresses small-system viability issues • Improves service affordability for customers • Provides ratemaking treatment similar to that for other utilities • Facilitates compliance with drinking water standards • Overall benefits outweigh overall costs • Promotes universal service for utility customers • Lowers administrative cost to the (state) commission • Promotes ratepayer equity on a regional basis • Encourages investment in the water supply infrastructure • Promotes regional economic development • Encourages further private involvement in the water sector	• Conflicts with cost-of-service principles • Provides subsidies to high-cost customers • Not acceptable to all affected customers • Considered inappropriate without physical interconnection • Distorts price signals to customers • Fails to account for variations in customer contributions • Justification has not been adequate in a specific case (or cases) • Discourages efficient water use and conservation • Encourages growth and development in high cost areas • Undermines economic efficiency • Provides unnecessary incentives to utilities • Not acceptable to other agencies or governments • Insufficient statutory or regulatory basis or precedents • Overall costs outweigh overall benefits • Encourages over-investment in infrastructure

Issue #4: Encouraging Pollution Prevention and Control: *How would putting excess revenues from contributions for receiving wastewater into a fund that will contribute to financing the cost of industrial and municipal compliance with EU standards affect ANAR's finances?*

Case studies carried out by the SEPIC project show that contributions for receiving wastewater (pollution charges) are quite low. As an illustration, we found that the pollution charges paid by a wood processing company in 2003 were approximately 1/10 the annual operating cost of a wastewater treatment plant that would eliminate the pollution problem. Moreover, enforcement seems to be rather weak: even the low pollution charges are not paid on a regular basis.

Pollution charges need to internalize environmental costs to society, so as to encourage polluters to change their behavior from polluting and paying for it to investing in projects that reduce pollution.

The main outcome of the scenarios run under this issue is that a major increase of wastewater related contributions can, on the whole, be sustained by ANAR's clients. Setting pollution contributions at a level that will motivate polluters to invest in pollution prevention and control should be accompanied by establishing a pollution prevention and control revolving fund, capitalized by excess revenues (that is, the excess of revenues from pollution contributions over the cost of wastewater monitoring). Such a fund would enable ANAR both to provide financial support for pollution minimization investments and to have close control over investment implementation.

Toward Setting Water- and Wastewater-Related Contributions and Penalties in Romania

I. Introduction

The USAID-funded SEPIC* Project includes the "ANAR Component," meant to support ANAR** as it prepares for Romania's accession to the EU.

In June 2004, we prepared and submitted a first report, "ANAR in Transition, Charting a Path to Sustainability" that outlines the challenges ANAR faces as its mandate changes in the course of EU accession. The main focus of that report was on issues impacting ANAR's sustainability in the new conditions created by the requirements of the EU's Water Framework Directive (WFD). Since that report was submitted, Romanian Water Law 107/1996 has been amended by Law 310/2004. Among other things, the new Water Law, intended to implement the requirements of the WFD, untied raw water price increases from the Consumer Price Index, allowing ANAR to set prices that would enable the organization to be sustainable.

ANAR is currently developing secondary legislation to the new Water Law. The proposed secondary legislation includes a law that would amend Law 404/2003, which set up ANAR in its present form. The main outcome of the secondary legislation law is that ANAR's status will be changed from a *regie autonome* to a public institution. Under its ANAR Component the SEPIC Project is assisting ANAR to develop water tariffs and pollution charges, henceforth "contributions," in the process of implementing the new Water Law and associated secondary legislation. This report, the substance of which has been reviewed and accepted by ANAR, represents the written product of that assistance.

This report revolves around its main component, a financial model describing ANAR revenues and expenses that is meant to be a decision support tool for ANAR and River Basin Directorate management. The model is described in Section II of the report. Use of the model was demonstrated to ANAR top management, and training was provided to relevant representatives of all eleven river basin directorates. Electronic working copies of the model were supplied to ANAR headquarters and to the river basin directorates.

In this report we address four major policy issues in four illustrative sets of option scenarios, and develop specific recommendations. The policy issues were selected in close consultation with ANAR top management as having a major impact on ANAR's revenues and costs under the current circumstances. The issues and associated scenarios are detailed and analyzed in Section III.

In Section IV we illustrate the way the model can be used to test composite scenarios. In section V we provide policy recommendations deriving from the demonstrations in sections III and IV.

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* "Support to Enhance Privatization, Investment, and Competitiveness in the Water Sector of the Romanian Economy"

** Administratia Nationala "Apele Romane"

Annex 1 contains in a condensed form, the reference data used in the report and an analysis of the financial status of the two pilot river basin directorates. Annex 2 includes a summary study of uncollected revenues and willingness and ability to pay for higher pollution charges.

Issues and associated scenarios included in this report are useful for important decisions ANAR will have to take in implementing the new Water Law, harmonized with WFD, such as cost recovery, increased monitoring costs, and using financial tools to preserve and obtain "good ecological quality" of water sources. We have also used the model to demonstrate the importance of a consistent, systematic approach of "externalization" of ANAR assets and activities, in order to allow ANAR to focus its resources on its core activities, and at the same time provide for its financial sustainability.

The financial model supplied on disc with this report projects revenues and costs at the national level. However, in training sessions with representatives of river basin directorates we demonstrated that the model can easily be adapted and used as a management tool for each river basin.

II. A Financial Model for ANAR

ANAR is facing a number of important issues in adjusting its price policies. This report includes a financial model, consisting of several spreadsheets, that allows for analysis of the effect of different operational policies on ANAR's revenues and expenses. This model is based on 2003 financial data, provided by ANAR and the two pilot basin directorates: Arges-Vedea (DAAV) and Siret (DAS). The spreadsheets are based on revenues generated under the present tariff structure; they compare revenues from water tariffs and pollution charges (contributions) with ANAR's expenditures. The output of the model is tariff adjustments needed to cover costs incurred under various circumstances represented in the policy scenarios.

A. Description of the Model

The model has a typical Revenue - Expense structure. The model is structured into four spreadsheets: a) "ANAR Data" includes basic ANAR data for 2003; b) "Aggregate" presents aggregated data showing the result of changing variables in scenarios; c) "Control Parameters" is the control table where magnitudes of expenses can be changed to result in specific costs and in total expense values, and tariffs can be changed to bring revenues to or above the level of expenses, producing a zero or positive surplus; d) "Scenarios" is where the aggregated outcome table for each scenario is presented, showing the resulting values. The model is versatile and allows running any relevant scenario, in addition to the ones considered in this report. Model variables are cost categories that are adjusted either up or down in the course of scenario analysis.

Revenues considered in the model:

- Contributions for raw water supply (water tariffs), by source and main categories of water users, as shown in Table1. These revenues are calculated by multiplying the actual volume of water supplied in 2003 by the value of specific water contributions, as set by Law 404/2003;
- Contributions for wastewater returned to waterways (pollution charges). These revenues are calculated as 80% of the supplied volume of water, multiplied by the average contribution for returning wastewater, both for 2003.

Expenses considered in the model:
These are shown as associated with revenue sources, in accordance with ANAR's practice, as follows:

- Costs covered by water supply contributions include: a) materials, depreciation, miscellaneous; b) salaries; and c) other expenses.
- Costs covered by contributions for wastewater include mainly pollution monitoring expenses.

Table 1: Water supply contributions (ROL/m^3), according to Law 404/2003

Water source	Companies, exclusive of drinking use	Public utilities & institutions, for drinking use	Agribusiness	Thermal power plants	Hydropower plants	Irrigation & fisheries
Underground	264	123	156			18
Reservoirs managed by ANAR	240			240	1	18
Danube	28			1	1	18
Reservoirs managed by others	238			238	1	18

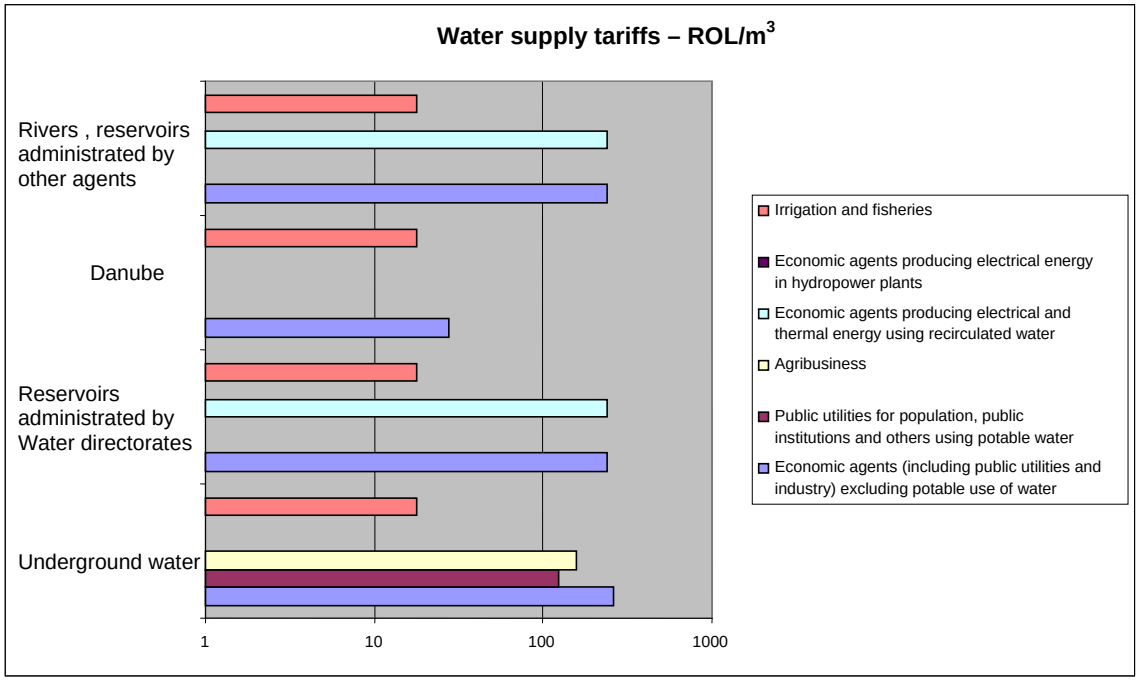
Calculations in the model are done by cost categories and by water sources and water users. The model has the ability to change each cost category, allowing ANAR to develop and implement a cost recovery policy. Specific costs and total revenues are calculated based on the input data in the spreadsheets "ANAR data" and "Aggregate." Input data include: a) amount of supplied water, by water source and water user category; and b) related tariffs. The model calculates and displays separate tariff increases for each source and type of water user, based on the difference between categories of expenses. The model only considers revenues from water- and waste water-contributions and the pertaining costs. Other sources of income and corresponding costs, such as those related to issuing permits, or to gravel and sand extraction, are not considered by the model.

Final data are also presented in graphic format and reflect any change in tariffs resulting in a revenue change. The tariffs for water supply are shown in Figure 1 below. Pollution charges are presented in a similar manner. In the balance bar chart, revenues for water supply are shown in blue and expenses for the same activity are shown in red. Both revenues and expenses related to pollution charges are shown in green in the bar chart.

B. Use of the model

Once the percentage increase in each expense category is determined (e.g. to compensate for inflation, or by negotiation with the unions), this value is input into the expense part of the control table. At the beginning of each modeling sequence, the control table values for increases are set to 0%. The costs resulting from a modeling run are calculated and displayed by the model. Recommended tariff changes, as compared to the baseline values, are displayed in the dedicated table, located under the balance figure in the Control Parameter spreadsheet. Tariffs may be changed for various scenarios. The model will indicate if any tariffs need to be increased (positive value), or decreased (negative value).

The model is delivered in electronic format as an Excel file. It is recommended to save the original file of the model as reference, and save separately the exercises carried out to explore the effects of changes of variables. The values may be modified as new considerations and or data present themselves. This analytic feature of the model gives ANAR the capability to explore options in a way that greatly and constructively informs its decision making process.



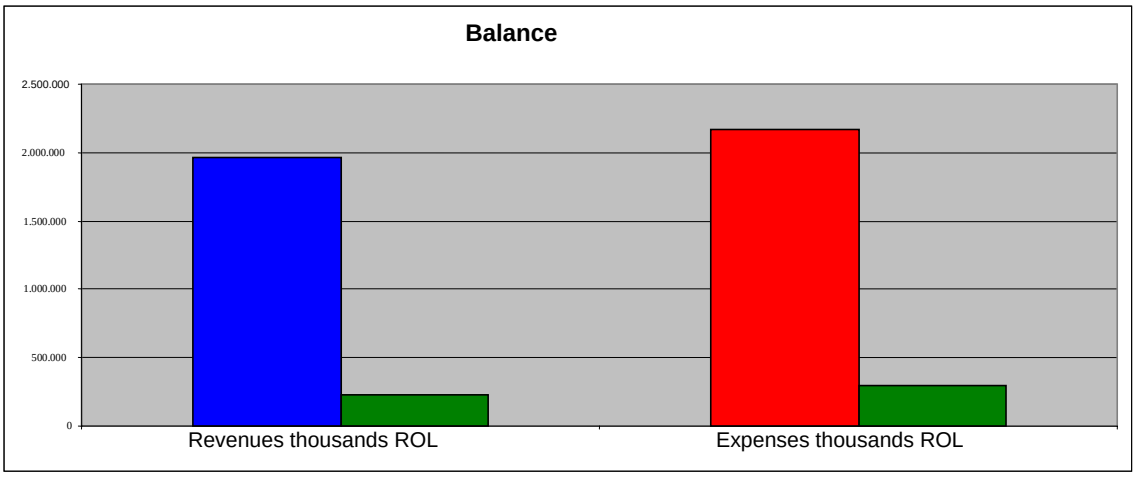


Figure 1: Structure of water tariffs, revenue and costs bars shown by the model

III. Pricing Issues in the Financial Modeling of ANAR

In this section we demonstrate the capabilities of the model to support decision-making. The demonstration is built around four policy issues identified by ANAR as important to the process of setting contribution levels. Each policy issue is dealt with in a dedicated subsection. The subsections are structured as follows: a) the policy issue is articulated as a question; b) the relevant operative framework is described; c) scenarios representing different assumptions regarding the policy are described, including how they are represented as altered variables when the model is run; d) the results of model runs are presented, showing the impact of different policy decisions on ANAR's finances; e) a question is presented that summarizes decision(s) either ANAR, or the Romanian Government (GoR), will have to take to fully address the policy issue.

Since the assumptions and recommendations associated with the various scenarios are meant to support future decision-making, including decision-making regarding legislation, they do not necessarily reflect the legal framework currently in force.

Scenarios were modeled under the following general assumptions:

- baseline data are for 2003;
- contributions for receiving wastewater (pollution charges), were considered as overall average values, and are not disaggregated for different types of pollutants and polluters;
- the volume of received wastewater equals 80% of the volume of supplied waters;
- in the short term, the volume of supplied water will be constant, at the 2003 amount.

A. Issue #1: Cost Recovery

How would meeting all required operation, maintenance, and rehabilitation costs, including maintenance and rehabilitation work backlog and contributing to capital costs, impact ANAR's cash flow and tariffs?

ANAR is a financially self-sustaining institution that has to meet its expenditures mainly from contributions generated by supplying raw water and receiving wastewater. Water supply revenues cover water management operation, maintenance and other costs, while revenues from receiving wastewater currently cover mainly monitoring costs. Investments for water management works will be covered totally or partially, depending on their nature, from state or local budgets; funds of water users; by issuing bonds guaranteed by the Romanian Government or local public administration; or from other sources, such as ANAR's own revenues. The Government aims to preserve ANAR's financial sustainability.

Price policy is a key element of financial sustainability.

The discussion below summarizes relevant provisions of the draft law, currently drafted by ANAR, (henceforth "draft law"). This draft law amends Law 404/2003, reshaping ANAR according to the new Water Law. Once adopted, implementation of the draft law will result in new costs, but will also generate potential new sources of revenue for ANAR, such as providing post-graduate education and continuing education in the fields of hydrology, hydrogeology, and water management. As mentioned earlier, we did not include such revenues in the financial model.

ANAR will have two kinds of activities, financed from two different sources: a) "commercial" activity, related to water management, such as supply of raw water and receipt of wastewater, financed from ANAR's revenues, and b) activities of national interest, co-financed by the state budget and ANAR revenues.

As a public institution, ANAR will not be able to deduct VAT, so some of its costs will be increased by 19%.

Revenues

Commercial activity is the main source of revenue for ANAR. Revenues include: a) contributions for supplying raw water and for receiving wastewater, based on signed subscriptions; b) payments for contracts dealing with common water management services, based on contracts; and c) penalties. The mechanism for setting contributions, as described by the new Water Law, is based on three principles: a) recovery of costs for knowing* and managing water resources, b) user pays and c) polluter pays. For the time being the current system of nationwide uniform contributions and penalties will be maintained.

* Knowing water resources include monitoring, among other specific activities.

The draft law also specifies prices for sand and gravel extraction and the fees payable to ANAR for issuing permits. As mentioned above, we do not consider these sources of revenue in our study. Revenues and costs related to sand and gravel are constants in the aggregated data table.

Activities of national interest, co-financed by the state budget and ANAR's own revenue include: "conservation of ecosystems and delineation of minor river beds in the state's public domain; maintenance and repair of flood protecting water management works in the state's public domain and flood protection activities; rehabilitation and commissioning of water management works in the state's public domain, damaged by natural calamities or other outstanding events; activities related to knowing the water resources as well as current hydrological activities and hydrological forecasts; implementation of provisions deriving from international conventions and agreements in the field of waters and for implementing EU Directives referring to waters, in order to fulfill commitments made by the Romanian state." The magnitude of annual budgetary allocations is expected to match the value of ANAR's revenues. The co-financing ratio varies depending on the type of activity.

Expenditures

ANAR as a whole by-and-large covers its expenditures by its revenues from water and wastewater contributions. In fact, ANAR's expenditures are constrained by its revenues, and as a result the need to maintain and rehabilitate its aging infrastructure is far from fully met. Arges-Vedea River Basin Directorate (DAAV) estimated a backlog of maintenance and rehabilitation work ranging in value from approximately $27,000 in 1994, to approximately $2 million in 2003, while the same values for Siret River Basin Directorate (DAS) range from $8.76 million in 1994, to $12.5 million in 2004. According to DAAV projections, the trend of increasing backlogs will continue in the future. The cost of maintenance and rehabilitation work that is not performed owing to insufficient revenue coverage is one of the indicators of need for tariff increases.

The principle of cost recovery, as called for in the WFD, applies to the recovery of capital costs as well as operating costs. ANAR's revenue neither contributes to the recovery of capital costs for major infrastructure investments nor sets aside resources to finance such investments. Since major infrastructure works are of national interest, their implementation is financed from budgetary allocations and, according to the Romanian law, depreciation is not charged for them. ANAR will continue to finance smaller scale investment, mainly required for WFD compliance and implementation. Due to state budget constraints, ANAR will have to partially finance rehabilitation of selected major infrastructure from own funds. Depreciation will be charged for all investments funded from ANAR's own revenue.

ANAR activities of national interest for purposes of our study include: a) operation and maintenance of water management works; b) implementation of the WFD; c) selected flood control related activities, such as operation and maintenance costs for DESWAT and WATMAN.

Scenarios

Scenario 1a shows the increase in contributions that would have been required to cover the full needs of operation, maintenance, and rehabilitation in 2003, the base year. We assume that the supplied volumes of water in the next 2-3 years will remain constant, although the historical trend is negative.

In 2003, at the overall ANAR level, water supply costs exceeded revenues from water contributions by $6.5 million, and water monitoring costs exceeded revenues from receiving

wastewater by $2 million. The specific percentage of tariff increase to cover the costs in 2003 is presented in Table 2. Rows and columns in Table 2 are the same as in Table 1.

Table 2: Water contribution increases to cover costs for Scenario 1a

Water source	Companies, exclusive of drinking use	Public utilities & institutions, for drinking use	Agribusiness	Thermal power plants	Hydropower plants	Irrigation and fisheries
Underground	13,99%	12,30%	16,00%			15,32%
Reservoirs managed by ANAR	14,61%			**16,31%**	15,01%	**11,11%**
Danube	12,60%			15,00%	15,00%	12,32%
Reservoirs managed by others	11,96%			12,27%	13,42%	12,00%

Scenario 1a shows that, in order to fully cover ANAR's current water supply costs, water contributions would have to be increased. Contribution increases would range from a minimal value of 11.1% for irrigation water extracted from surface sources to a maximal increase of 16.3% for surface water used in thermal energy production. Since the tariffs are currently the same for every basin directorate, this applies to the whole country. Pollution charges would have to increase 29.15% to cover water quality management (monitoring) costs.

Scenario 1b (Table 3, below) shows the tariff increases necessary to cover the full needs of operation, maintenance and rehabilitation, and considers including depreciation for a certain percentage of average annual water infrastructure development investment. Scenario 1c (Table 4, below) shows the tariff increases necessary to cover the full needs of operation, maintenance, and rehabilitation, and considers including depreciation for 100% of average annual water infrastructure development investment. For the purposes of Scenarios 1b and 1c we used the DAAV structure of investments shown in Figure 2. In the early 1990s the state financed all planned investment; beginning 1996 ANAR partially financed planned investments from its own funds. In 2002 and 2003 approximately 20% of the planned investments were not implemented due to lack of funds.

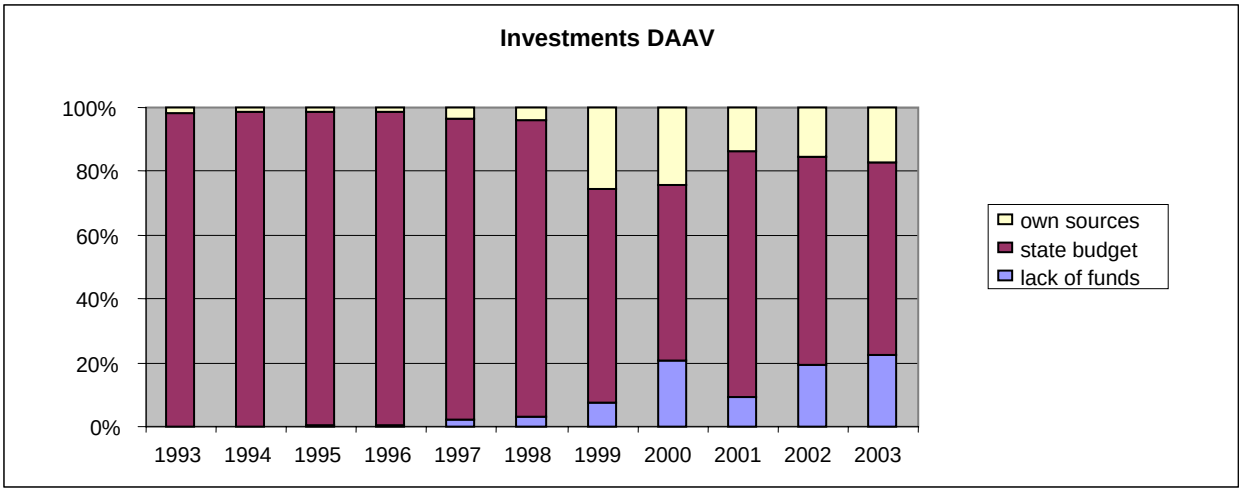


Figure 2: DAAV investment financing status

Scenario 1b. In 2003, DAAV's total need for investment was $6.29 million. Budget funds covered 60.3% and ANAR funded 17.4% from its own revenues. The remainder, 22.3%, was not implemented due to lack of funds. We considered the hypothetical case in which all investment actually implemented in 2003 was financed by ANAR. This would have increased depreciation costs in 2004 by 347%. Though in reality depreciation costs may differ by water

source and type of customer, in this exercise we could only make a global estimate, without such disaggregation. Following adjustment of depreciation cost values in the control table, the model produced the necessary percentage water contribution increases shown in Table 3. In this intermediate scenario, tariff increases range from 41.4% to 46.9%.

Table 3: Water contribution increases to cover costs for Scenario 1b

Water source	Companies, exclusive of drinking use	Public utilities & institutions, for drinking use	Agribusiness	Thermal power plants	Hydropower plants	Irrigation and fisheries
Underground	43,97%	41,84%	46,52%			44,53%
Reservoirs managed by ANAR	44,74%			**46,90%**	45,26%	40,08%
Danube	42,22%			45,24%	45,24%	41,87%
Reservoirs managed by others	**41,40%**			41,79%	43,25%	41,46%

Scenario 1c. Depreciation for a given year's investment begins the following year. For the purposes of this Scenario 1c, we consider the hypothetical case in which DAAV would have funded from its own funds all the investment implemented between 1993 and 2003. In this case, in 2003 depreciation costs would have increased 17 times (1,729%). This shows that budget-financed investments are still large as compared to ones funded by ANAR. For the calculation in the model we consider 1,700% higher depreciation costs in 2003. Again, though in reality depreciation costs may differ by water source and type of customer, in this exercise we could only make a global estimate, without such disaggregation. Water contribution increases needed to cover depreciation costs in this scenario are shown in Table 4. In this extreme case ANAR's tariff increases would have ranged from 153% to 166.2%.

Table 4: Water contribution increase to cover costs for Scenario 1c

Water source	Companies, exclusive of drinking use	Public utilities & institutions, for drinking use	Agribusiness	Thermal power plants	Hydropower plants	Irrigation and fisheries
Underground	160,86%	157,00%	165,51%			158,42%
Reservoirs managed by ANAR	162,26%			**166,16%**	163,24%	**153,05%**
Danube	157,68%			163,15%	163,16%	157,07%
Reservoirs managed by others	156,21%			156,91%	159,55%	156,33%

Question for ANAR: Since the WFD allows flexibility and does not require full recovery of capital costs through contributions, what proportion of capital costs will have to be borne by ANAR in the next years, according to government policy?

B. Issue #2: Externalization

How will externalization affect ANAR's cash flow and tariffs?

According to the draft law, ANAR is mandated to liquidate or externalize activities not directly related to water management. Externalization may be performed by: a) concession of activities and assets from ANAR's own property or the private property of the state; b) selling ANAR assets; c) setting up commercial companies, with ANAR as sole shareholder; d) transfer of activities and assets to other legally established bodies; e) association with individuals or legally established bodies; f) other methods.

Scenarios 2a and 2b below show the impact on expenditures of different hypothetical decreases of ANAR's maintenance work force, spun off to newly established enterprises. For purposes of these scenarios, we assume that, following externalization, work previously performed by ANAR's labor force will be contracted out, which will reduce ANAR's cost for salaries and will increase materials costs. ANAR expects that its overall costs will not decrease significantly, but that externalization will, among others things, allow for monetary incentives to stabilize a qualified workforce. In Scenarios 2a–2c we compare the needed contribution increases in order to bring revenues and expenses into alignment, maintaining the cost recovery principle of the base scenario under Issue #1 above.

For analysis of the financial impacts of externalization, several cost parameters have been changed: a) depreciation decreases slightly due to externalization of minor assets; b) salary costs decrease due to work force spin-off (decrease may not be proportional to the decrease in workers, owing to increased salaries for the remaining workforce); and c) material expenses increase due to contracts signed with the newly established companies.

Scenario 2a (Table 5). A case in which: a) 400 persons are transferred to the spin-off enterprises, reflected in the control table by a 5% decrease of salary costs; b) a 2% decrease of depreciation costs in the control table related to assets transferred to the new enterprise; c) a 16% increase in the material expenses in the control table, reflecting the value of work subcontracted to the new enterprise, calculated as 4.46% of the salaries fund (which accounts for 60% of total costs) and added to the material expenses (accounting for 17% of total costs). We considered that the personnel involved in maintenance are not kept busy all year round. If employed by ANAR they would be paid full salary every month. A separate company will charge only their effective working time, assumed at 9 months/year (75%). This leads to a 4.46% decrease of costs for salaries (3.75% from the former salaries, plus 19% VAT).

Scenario 2b (Table 6). A case in which there is no decrease in salaries costs. The same figures as in Scenario 2a, but the available 5% of salaries is used to increase salaries of the remaining labor force. The same decrease in depreciation and the same increase in material expenses is applied.

Scenario 2c (Table 7). A case in which ANAR transfers ownership and maintenance of local interest minor infrastructure to local governments. These are mostly civil works for water storage, flood protection, and river regulation. Externalization will result in a decrease of both the labor force and ANAR's expenditures. In the control table, this is reflected by: a 15% reduction in salaries costs; a 20% reduction in depreciation costs; and a 5% increase in material expenses showing that the contracted maintenance work remains the same.

Table 5: Water contribution increases to cover costs for Scenario 2a

Water source	Companies, exclusive of drinking use	Public utilities & institutions, for drinking use	Agribusiness	Thermal power plants	Hydropower plants	Irrigation and fisheries
Underground	18,65%	16,89%	20,74%			20,07%
Reservoirs managed by ANAR	19,29%			**21,06%**	19,70%	**15,64%**
Danube	17,20%			19,70%	19,70%	16,91%
Reservoirs managed by others	16,53%			16,85%	18,06%	16,58%

Contribution increases are higher than those needed to cover costs in Scenario 1a, as a result of a high maintenance backlog. The range is 15.6% to 21.1%.

Table 6: Water contribution increases to cover costs for Scenario 2b

Water source	Companies, exclusive of drinking use	Public utilities & institutions, for drinking use	Agribusiness	Thermal power plants	Hydropower plants	Irrigation and fisheries
Underground	21,00%	19,20%	23,13%			22,42%
Reservoirs managed by ANAR	21,65%			**23,46%**	22,08%	17,93%
Danube	19,52%			22,07%	22,07%	19,22%
Reservoirs managed by others	18,84%			**19,17%**	20,39%	18,89%

Contribution increases range from 19.2% to 23.5%, allowing for salary increases for the remaining workforce. This would likely enable ANAR to improve the union-management relationship and stabilize a qualified workforce.

Table 7: Water contribution increases to cover costs for Scenario 2c

Water source	Companies, exclusive of drinking use	Public utilities & institutions, for drinking use	Agribusiness	Thermal power plants	Hydropower plants	Irrigation and fisheries
Underground	7,46%	5,87%	9,35%			8,84%
Reservoirs managed by ANAR	8,04%			**9,64%**	8,41%	**4,74%**
Danube	6,15%			8,41%	8,41%	5,88%
Reservoirs managed by others	5,54%			5,83%	6,92%	5,58%

In this case the range of contribution increases is significantly smaller than in the baseline Scenario 1a, dropping to 4.7% to 9.6%. Substantial externalization is one of the solutions to reduce pressure on the salary fund allowing wage increases for the remaining personnel.

Scenario 2d. To demonstrate a different way to use the model, we determine the reduction in depreciation costs from transferring assets to local administrations so as to maintain current tariff rates. Materials expenses are increased by 5% and salaries costs are reduced by 20% in the control table. Running the model shows that in order to break even and keep the same tariffs at the same time, depreciation costs must decrease by 60-70%. This percentage is raising a serious question for ANAR regarding its future externalization policy.

Question for ANAR: What will be the types and extents of externalizations and their associated costs in terms of operation, maintenance, and depreciation?

C. Issue #3: Price Differentials

How would adjustments in the price differentials among different users and among water sources with different water quality impact ANAR's cash flow and tariffs?

Price differentials among different categories of users and water sources may:

- promote efficiency in water use
- provide positive or negative incentives for specific uses of water
- be an instrument for environmental and financial sustainability
- aim at achieving social objectives.

Currently the same set of water prices is applied in all eleven river basins. The draft law specifies penalties for excessive water consumption and for exceeding pollution discharge limits, and provides incentives for careful water users. In the final section of this report we discuss the merits and shortcomings of a universal set of water prices. In this section we briefly discuss price differentiation based on the performance of water users.

In order for the price of raw water to be an instrument for encouraging efficient resource allocation, it should reflect scarcity (opportunity cost) as well as the cost of making the resource available. In this context, raising the water contribution for hydropower generation by 1 ROL/m^3 may raise ANAR's revenue by 19.5% and yield a positive profit.

Uncollected revenue generates the risk of lack of cash for ANAR. The risk is normally associated with the variation of the time-distribution of the uncollected revenue. Our calculations suggest that for DAS* the average uncollected revenue for the last 10 years is 25% of the billed revenue, with a 4.33% standard deviation. If we represent the probability to collect revenues as a function of collected revenue for DAS (Figure 3, below) we see that beyond a certain level of total collected revenue the probability of collecting additional revenue decreases sharply (and then the rate of decrease in the probability begins to diminish beyond the 25-30% level). This may also represent a measure of water users' willingness or ability to pay.

The suggestion is to include a risk component in the water tariff to create a differential in levels of contribution among water users in order to transfer the financial effects of uncollected contributions only to the bad paying categories of clients. This component needs to be adjusted periodically: either up if water users continue to be in arrears, or down if they improve payment performance. A lower uncollected risk component would be an incentive for good water users. By introducing such tariff differentials ANAR will be able to monitor water user performance in terms of payment. Implementation of this concept requires a specific monitoring system and procedure.

Question for ANAR: Is ANAR willing to make any price changes, and if so, in what direction?

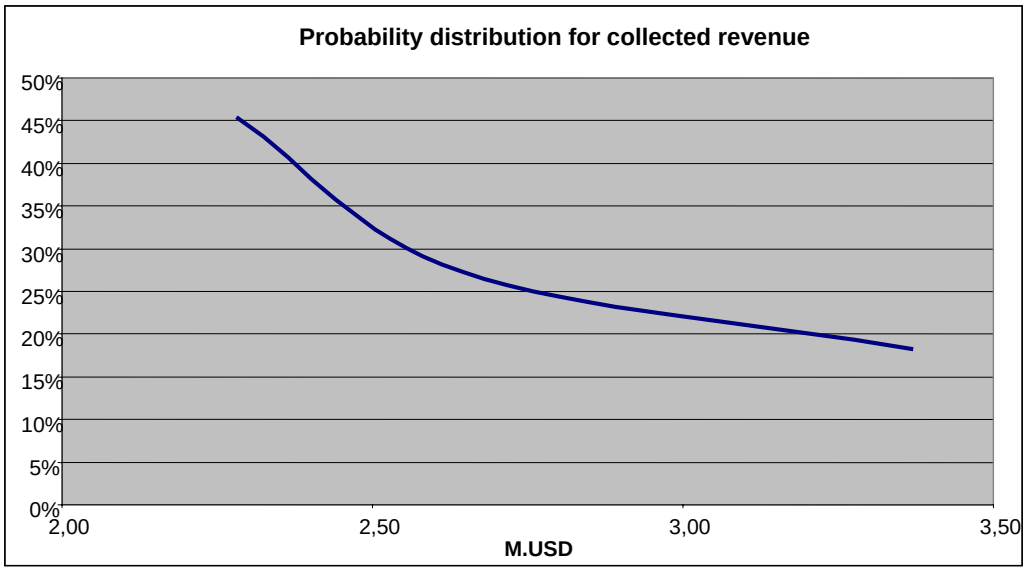


Figure 3: Distribution of probability to collect revenues for DAS

* DAAV is not typical as it receives 80% of revenue from Bucharest Apa Nova, a private concession that started paying bills promptly after the start of activity in 2000.

D. Issue #4: Encouraging Pollution Prevention and Control

How would putting excess revenues from contributions for receiving wastewater into a fund that will contribute to financing the cost of industrial and municipal compliance with EU standards affect ANAR's finances?

Contributions for receiving wastewater (pollution charges) are in many countries accepted as means to generate resources for investment in pollution abatement. The economic rationale is that they should be set in relation to the "external costs" (social costs) of pollution and should provide incentives to industry to reduce pollution.

In the case of ANAR, contributions for receiving wastewater are designed to cover only pollution monitoring costs. Raising pollution charges to approximate the social economic cost of pollution would substantially increase revenues. ANAR could retain a fraction of the revenues and make the greater part of the revenues available for investment in pollution prevention and control, to leverage environmental investment by polluters. This would help attain the major objective of the WFD: achieve good ecological status of waters.

Experience has shown that, in order to change the behavior of top management in polluting entities, pollution charges need to be high enough to get their attention and provide an incentive to reduce pollution discharge. The significance of pollution charges varies depending on the size and prosperity of polluters. However, top management is concerned with cost control and seeks to eliminate unproductive costs. High pollution charges provide needed leverage in negotiations with polluters, whereby top management of the polluting company may be allowed to pay only a portion of the charges and dedicate the rest to financing environmental investment. High enough pollution charges may funnel revenues collected from "bad" polluters into a fund used by ANAR to actively intervene in concerned polluters' efforts to improve their environmental performance.

Scenario 4a demonstrates the way potential costs to polluters for meeting WFD and Integrated Pollution Prevention and Control (IPPC) implementation requirements may be taken into account when developing wastewater contribution levels, in order to trigger a change in the environmental behavior of ANAR customers. The example is built around a long range marginal cost calculation example for DAAV, and relates to a Bucharest municipal wastewater treatment station, a badly needed investment. A large percentage of DAAV revenues come from the Bucharest Water Company, thus the choice and significance of the following calculation. Moreover, investments needed to comply with the EU directive 91/271/EEC regulating discharges of municipal wastewater treatment stations are known in detail for the polluters of the Arges basin.

The timeframe for building the wastewater treatment plant and the value of investment are essential in determining Long Range Marginal Cost (LRMC). We make following assumptions: a) the discounted values of the investment are computed over a time span of 13 years, out of which in each of the first 3 years an investment of $100 million/year is made; the volume of treated water discharged in the next 10 years is treated for a charge that is the LRMC; b) the volume of used water evacuated will remain constant every year at the same level as in 2003 (499,884 million m^3); c) the discount factor(df) is 10%.

We introduce the above values in the formula for the LRMC, using USD values:

$$LRMC = \Sigma_{t=1-3}\, I(t)/(1+df)^{\wedge}(t) \,/\, \Sigma_{t=4-13}\, V(t)/(1+df)^{\wedge}(t) = 3.12E\text{-}2\ USD/m^3.$$

For the present exchange rate of 33,200 ROL/USD, LRMC = 1036.34 ROL/m^3.

The LRMC (1036 ROL/m^3) is 16.7 times higher than 61.8 ROL/ m^3, the present average pollution charge for receiving wastewater, charged to public utilities in the Arges Rive basin. At the 2003 level of expenses, increasing contributions for receiving wastewater 16.7 times would result in a 3,800 billion lei surplus (profit) for ANAR. This would provide sufficient money for a credible guarantee or participation fund for environmental investments required to comply with EU environmental directives (or to comply with Romanian pollution standards). Another approach would be to charge the polluter only a part of the higher rate on condition that the balance is used to fund pollution prevention and control investment.

However, increasing pollution charges is limited by the ability of the polluters, such as Bucharest citizens, to pay the contributions. A 17-fold increase of pollution charges should be accompanied by implementation of a mechanism whereby some of the collected money would be returned to water users for financing environmental investments; otherwise, the willingness to pay, or rather lack thereof, may strongly increase the level of uncollected contributions for receiving wastewater.

Scenario 4b shows the impact of a substantial increase of contributions for receiving wastewater. This scenario is based on findings from analyzing DAAV and DAS data on pollution charges; it does not use the financial model, so as to demonstrate that other tools are also available for informing decisions. First, since 1996, revenues generated from pollution charges, expressed in USD/m^3, rose approximately 6.9 times in DAS and 2.3 times in DAAV. Figure 4 presents the correlation between the magnitude of the pollution charge and the corresponding uncollected revenue for DAAV. The figure shows a discontinuity of behavior: the downward trend of uncollected revenue with increased pollution charges is suddenly reversed over the limit value of 1.2 to 1.3 USD/1000 m^3. In order to raise limit values measuring the willingness to pay, it is important to devise a mechanism to return pollution related funds into the economy and fund environmental projects. This may allow raising pollution charges to the level of the LRMC and induce pollution prevention investment. The discussion above suggests that the level of willingness to pay limit is approximately half the 17-fold increase that emerged from the LRMC calculations under Scenario 4a.

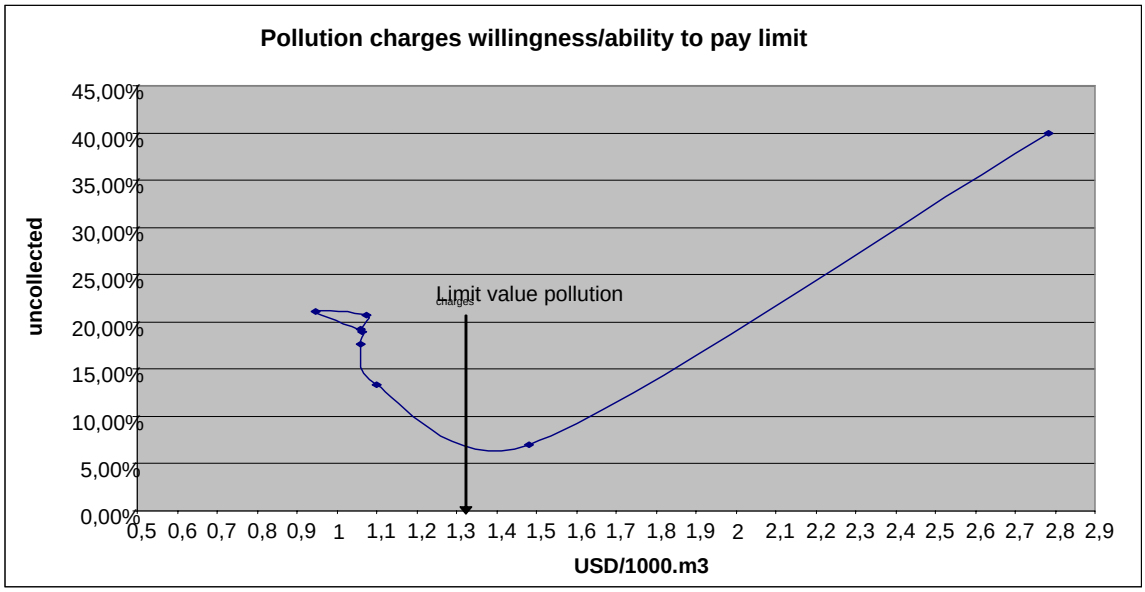


Figure 4: Willingness to pay chart for DAAV

In this scenario the pollution charges were raised only 7-fold. The resulting profit is 1,550 billion ROL and the revenue is comparable to the one from water supply activities. Again we have to stress the importance of setting up a support fund for environmental protection projects.

Question to ANAR: To what extent is the Government of Romania prepared to raise contributions for receiving wastewater and establish a fund to contribute to environmental investments in polluting institutions?

IV. Composite Scenarios

In Section III we demonstrated the usefulness of "simple" scenarios to address important issues related to setting water and wastewater contribution levels. Each scenario focused on parameters relevant to the issue in question, and the analysis yielded the rate increases necessary to respond to that specific issue. In what follows we combine separate "simple" scenarios into "composite" scenarios and will evaluate the overall variation of the contributions. Table 8 below summarizes the "simple" scenarios and suggests ways to combine them into composite scenarios.

In Table 9, below, we define three composite scenarios by combining simple scenarios shown in Table 8. The composite scenarios detailed below, are numbered i, ii, iii to distinguish them from simple scenarios, and changes in the parameters are shown in Table 9:
Scenario i: ANAR becomes a fully funded public institution, performing all activities under its mandate and covering all costs from contributions. ANAR takes over property of state budget funded investments implemented between 1993 and 2003 (Scenario 1c). Most local interest infrastructure is transferred to local governments, and maintenance assets are transferred to new spin-off companies. Estimated depreciation cost reduction: 1,000%. Salary costs reduced by 20% following reduced maintenance costs for externalized minor infrastructure (-15% per Scenario 2c) and transfer of 400 maintenance staff to spin-off company (-5%, per Scenario 2a). Pollution charges are raised to LRMC level, reflected by an increase of 1,674% in related revenues (Scenario 4a);
Scenario ii: ANAR takes over the property of investment financed by the state budget as of 2003 (Scenario 1b); maintenance activity is externalized to spin-off companies (Scenarios 2a and 2b). Maintenance related assets are transferred to new spin-off companies;
Scenario iii: Same as Scenario ii, but maintenance is completely externalized.

Table 8: Simple scenarios summary

Scenario #	Cost variable change				Tarif variation	Obs.
	Material	Depreciation	Salaries	Pollution charge		
1a	0%	0%	0%	29%	11,1%-16,3%	cover present costs
1b	0%	347%	0%	29%	41,4%-46,9%	cover capital expense for maintenance
1c	0%	1700%	0%	29%	153%-166,2%	cover all capital expenses
2a	16.00%	-2%	-5%	29%	10,6%- 15,7%	externalize maintenance an keep salaries
2b	4.46%	-2%	0%	29%	13,7%-18,7%	externalize maintenance and raise salaries
2c	5%	-20%	-15%	29%	4,7%-9,6%	transfer to local administration
2d	5%	-20%	0%	29%	4.33%	transfer of assets to local administration
4a	0%	0%	0%	1674%	11,1%-16,3%	LRMC for water treatment station constrained by capacity to pay
4b	0%	0%	0%	700%	11,1%-16,3%	make environmental support fund

Table 9: Composite scenarios - parameters to be changed

Scenario #	Cost variable change, and explanation			
	Material	Depreciation	Salaries	Pollution charges
i.	16 % (value of outsourced maintenance costs, Scenario 2a)	700% (depreciation rises 1700% per Scenario 1c, and estimated 700% of this remains after asset externalization)	-20% (reduced costs due to outsourcing maintenance, Scenarios 2a and 2c)	1674% (increased according to LRMC in Scenario 4a)
ii.	4.5% (value of outsourced maintenance costs, Scenario 2b)	347% (ANAR takes over property of state-financed investment as of 2003, Scenario 1b)	-5% (400 maintenance workers transferred, Scenario 2a)	700% (no change in payment behavior)
iii.	9% (estimate based on Scenario 2b)	347% (ANAR takes over property of state-financed investment as of 2003, Scenario 1b)	-10% (estimated figure, based on Scenario 2a)	700% (same as Scenario ii)

The recommended increases in tariffs to offset costs for each scenario are presented in Tables 10 to 12, below. Balances of revenues (blue) and expenses (red) are shown in the associated figures (pollution revenues and expenses are in green).

Table 10: Water contribution increases for Scenario i

Water source	Companies, exclusive of drinking use	Public utilities & institutions, for drinking use	Agribusiness	Thermal power plants	Hydropower plants	Irrigation & fisheries
Underground	73,14%	70,58%	76,22%			73,00%
Reservoirs managed by ANAR	74,07%			**76,66%**	74,71%	**68,23%**
Danube	71,03%			74,67%	74,67%	70,62%
Reservoirs managed by others	70,06%			70,52%	72,28%	70,13%

The range of tariff increases for Scenario i is 68.2% to 76.7%. Under this scenario the tariff increase is reduced by externalization. Pollution charges, increased to the value of the LRMC calculated under Scenario 4a, generate funds to help finance environmental protection. Limited ability to pay may hamper collection of some pollution charges.

Table 11: Water contribution increases for Scenario ii

Water source	Companies, exclusive of drinking use	Public utilities & institutions, for drinking use	Agribusiness	Thermal power plants	Hydropower plants	Irrigation & fisheries
Underground	43,47%	41,34%	46,01%			44,05%
Reservoirs managed by ANAR	44,24%			**46,38%**	44,76%	**39,59%**
Danube	41,72%			44,73%	44,73%	41,37%
Reservoirs managed by others	40,91%			41,30%	42,75%	40,97%

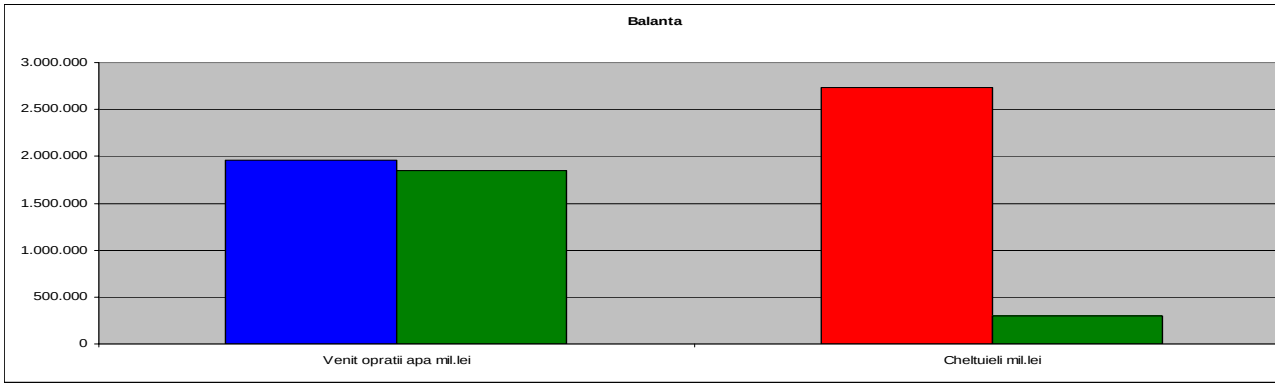


Figure 5: Balance between revenues and costs for Scenario ii

The range of tariff increases for Scenario ii is 39.6% to 46.4%. This scenario seems more attractive to ANAR, as it does not imply a large increase of water tariffs, and pollution charges are closer to the ability to pay limit: uncollected revenues are unlikely to increase.

Table 12: Water contribution increases for Scenario iii

Water source	Companies, exclusive of drinking use	Public utilities & institutions, for drinking use	Agribusiness	Thermal power plants	Hydropower plants	Irrigation & fisheries
Underground	43,14%	41,02%	45,67%			43,74%
ANAR Reservoirs	43,90%			**46,04%**	44,42%	**39,25%**
Danube	41,39%			44,40%	44,40%	41,05%
Reservoirs managed by others	40,58%			40,97%	42,42%	40,64%

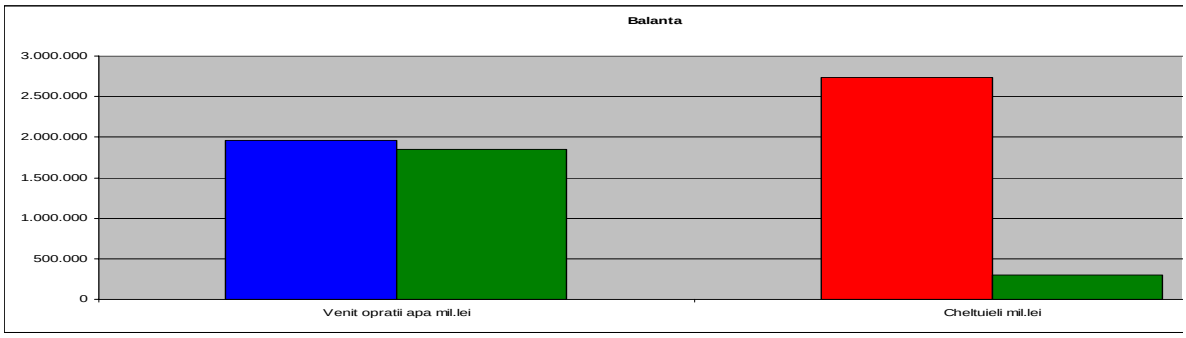


Figure 6: Balance between revenues and costs for Scenario iii

The range of tariff increases for Scenario iii is 39.2% to 46%. This range is comparable to that under Scenario ii. Under Scenario iii, ANAR would be able to increase salaries and maintain a stable skilled workforce due to reduced pressure on the salaries fund.

The composite scenarios reveal that should ANAR be required to assume responsibility for assets financed from the state budget, water tariffs would have to be raised in excess of 45%.

V. Observations and Recommendations

A. Issue #1: Cost recovery

How would meeting all required operation, maintenance, and rehabilitation costs, including maintenance and rehabilitation work backlog and contributing to capital costs, impact ANAR's cash flow and tariffs?

In order to fully recover operation and maintenance costs, ANAR must raise water tariffs by 11% to 16% for different categories of water users, as shown in Table 2, for the "baseline" Scenario 1a. Water tariff increases should be combined with the 29% increase in pollution charges needed to cover monitoring costs. Compared to this baseline, ANAR may consider increasing its involvement in capital costs, such as:

a) take over assets owned by the State (Scenario 1b, Table 3), which implies tariff increases of up to 47% or,
b) take over the full investment burden from the state budget (Scenario 1c, Table 4), which implies tariff increases of up to 166%.

The best approach would be to gradually transfer investment to ANAR over a period of 10 years, yielding annual tariff increases of up to 16%.

B. Issue #2: Externalization

How will externalization affect ANAR's cash flow and tariffs?

The draft law leaves ANAR the liberty to decide on the moment of externalization and on the actual non-core assets and activities to be externalized. Our recommendation is that as a first step, ANAR carefully define the national-level objectives it wants to achieve through externalization, and then undertake the same exercise at the river basin level. The main externalization steps taken so far consist of transferring certain local-interest assets to local administrations along with the responsibility for their rehabilitation and maintenance. This transfer should be accompanied by measures to ensure that transferred assets are well maintained (technical skills and funding needed) and will not deteriorate in time.

- Minor externalization would lead to tariff increases of up to 23.5% for different categories of water users (compared to the baseline increase of up to 16% shown in Scenario 1a, Table 2). A more substantial transfer to local administrations would reduce costs, resulting in necessary tariff increases only of up to 9.6%, as shown in Table 7, for Scenario 2c; this is well under the baseline increase of 16%. Some externalization alternatives, such as concessions, may generate additional revenue for ANAR. However, properly executing such concessions requires major efforts and time-consuming procedures, and therefore this course should be very carefully analyzed before taking any decision.

C. Issue #3: Price Differentials

How would adjustments in the price differentials among different users and among water sources with different water quality impact ANAR's cash flow and tariffs?

The shift of ANAR toward a self-sustaining institution prompts consideration of the tariff differential issue. Our recommendation is that at the appropriate time consideration be given including a risk component in tariff rates. Based on objective data, we calculate that a risk component in the range of 4% of tariffs would offset exposure to lack of cash from uncollected revenue. The contribution paid by bad customers should be higher than that paid

by good customers. Including the risk component in the tariff would motivate users to promptly pay their bills and enhance collection.

We have found that single-tariff pricing (applying a uniform set of tariffs over the entire geographic area serviced, without respect to the actual cost of providing water to any geographic sub-area) similar to that practiced by ANAR is also practiced rather widely by both public and private water utilities in the US. In the US, tariffs are approved by the respective US state public utility commissions. Many of the state public utility commissions have found that single-tariff pricing is in the public interest, and that it conforms to prevailing standards concerning just, reasonable, and nondiscriminatory rates. Some commissions have found that single-tariff pricing is not inconsistent with cost-of-service principles or with commission ratemaking authority.

Many investor-owned utilities in the US have strongly urged regulators to recognize that these companies provide all of their customers the same brand-name product, a safe and reliable supply of potable water, and that single-tariff pricing reflects that, and also makes the product more affordable. Essentially, single-tariff pricing makes it possible for all customers to share in the total economies of scale and scope achieved by the utility.
Usually the debate in the US centers on cost differences associated with providing water service to urban and rural areas. Rural areas can be more expensive to service because of the cost of service-line extensions and lack of economies of scale. The known result of strictly cost-based pricing would be to discourage extension of "modern" services to rural areas.

Table 13 summarizes arguments in favor and against single tariff pricing, for the consideration of ANAR. Some of the arguments may be not applicable in the context of Romania.

Table 13: Arguments For and Against Single-Tariff Pricing

Arguments in Favor	Arguments Against
• Mitigates rate shock to utility customers • Lowers administrative costs to the utilities • Provides incentives for utility regionalization and consolidation • Physical interconnection is not considered a prerequisite • Addresses small-system viability issues • Improves service affordability for customers • Provides ratemaking treatment similar to that for other utilities • Facilitates compliance with drinking water standards • Overall benefits outweigh overall costs • Promotes universal service for utility customers • Lowers administrative cost to the (state) commission • Promotes ratepayer equity on a regional basis • Encourages investment in the water supply infrastructure • Promotes regional economic development • Encourages further private involvement in the water sector	• Conflicts with cost-of-service principles • Provides subsidies to high-cost customers • Not acceptable to all affected customers • Considered inappropriate without physical interconnection • Distorts price signals to customers • Fails to account for variations in customer contributions • Justification has not been adequate in a specific case (or cases) • Discourages efficient water use and conservation • Encourages growth and development in high cost areas • Undermines economic efficiency • Provides unnecessary incentives to utilities • Not acceptable to other agencies or governments • Insufficient statutory or regulatory basis or precedents • Overall costs outweigh overall benefits • Encourages over-investment in infrastructure

D. Issue #4: Encouraging Pollution Prevention and Control

How would putting excess revenues from contributions for receiving wastewater into a fund that will contribute to financing the cost of industrial and municipal compliance with EU standards affect ANAR's finances?

Case studies carried out by the SEPIC project show that contributions for receiving wastewater are quite low. In the case of a wood processing company, the pollution charges paid by the company in 2003 are approximately 10 times lower than the annual operating costs of the needed wastewater treatment plant. Moreover, enforcement seems to be rather weak, as even existing low pollution charges are not paid on a regular basis.

Pollution charges need to internalize environmental costs to society, so as to encourage polluters to change their behavior from polluting and paying for it, to investing in projects that reduce pollution. To demonstrate one internalization example, we calculated the long range marginal cost (LRMC) associated with the investment in a wastewater treatment station by a municipal water regia (such investments are also needed to comply with EU directives, such as WFD and IPPC). The calculated value of LRMC suggests a 17-fold increase in pollution charges would be needed for this. Analysis of willingness and ability to pay based on DAAV and DAS statistics shows that increasing the current level of pollution charges is limited to around seven times current rates. Some portion of additional revenues from pollution charges should be placed in a revolving fund to help finance pollution abatement investments. In this way polluters will be helping to finance a reduction in pollution throughout the Romanian economy.

ANNEX 1

Economic and Financial Analysis of Pilot Water Directorates

This document includes a summary of the processed data provided by the two River Basin Directorates (DAAV and DAS) and by ANAR. This data was used to develop the financial model and the scenarios in the body of the report. Since we are discussing data referring to the period before adoption of the New Water Law, we used the old "tariff" and "charge" denominations, instead of the new "contribution".

I. Description of directorates

A. Siret River Basin

General data
Siret river flows in the northeastern part of the country, from north to south, over a 559 km long course and discharges into Danube. Siret's western tributaries originate in the Carpathian mountain range and are flood prone. The topography to the east of Siret is flat. At hydrometrical station Lungoci the surface area of the basin is 36,083 km^2, the average multi-annual flow is of 153 m^3/s. Siret has Romania's largest water basin: 42,890 km^2, with a hydrographical length of 15,157 km. The average altitude is 539 m. Siret river basin includes the following counties: Suceava, Iași (partially), Neamț, Bacău, Vrancea. The population living in the Siret river basin is of about 2.8 million inhabitants.

The Siret Water Directorate is headquartered in Bacau. It has 985 employees, of which 147 work at headquarters. The number of employees decreased substantially from a maximum of about 1,500 in 1994, due to financial constraints. Further decreases are expected following externalization and automation of the monitoring infrastructure. The Directorate has seven area divisions: four "Water Management Districts" covering Bacau, Suceava, Neamt, and Vrancea judets, and three "Hydro-technical Units" which manage major installations in their respective area: Siret, Pascani and Caraboaia. The Caraboaia Unit operates a drinking water plant which will be transferred to the local government.

The main polluters in the Siret River Basin are: a) industries: extractive, chemical, petrochemical, pulp and paper, animal breeding; and b) municipal wastewater treatment plants. Main polluters are listed in Table 1, below.

Table 1- Main polluters in the Siret River Basin

Type of industry	Name of Factory
Petrochemical	RAFO Refinery Borzesti ; Darmanesti Refinery; CAROM Onesti; CHIMCOMPLEX Borzesti
Chemical	Letea Bacau; AZOCHIM Roznov; CCH Piatra Neamt; Synthetic Fibers Savinesti
Mining	Mining Calimani; Mining Crucea
Livestock	Piggery farm Veresti
Other industries	Intreprinderea de postav (Canvas production) Buhusi ; DUCTIL Buzau
Municipal WWTPs	Bacau, Suceava, Iasi, Focsani, Buzau, Piatra Neamt

Figure 1 shows the dynamics of the water quality between 1998-2002. The length of good quality river courses increased approximately 10%, as class II length decreased and class III disappeared completely. However, length of polluted courses staid the same.

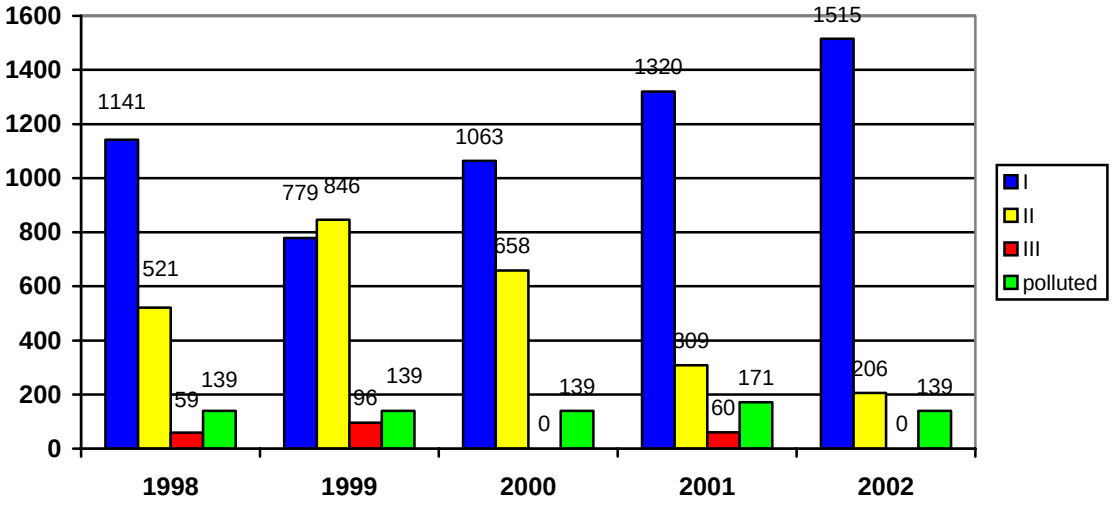


Figure 1. Evolution of the water quality in the SIRET basin (river length in km) according to STAS 4706/1998

Assets
Main assets of DAS are mentioned in Table 2, below.

Table 2- Main assets of DAS

Water resources	Multipurpose use storage lakes	Civil infrastructure for flood control	Integrated monitoring system
- Surface water: 1.955 million m^3 - Underground water: 700 million m^3	- Number: 30 - Total volume: 1.933 million m^3 - Wet volume: 1.253 million m^3	- Length of shore protection: 527 km - Length of river bed regularization: 525 km - Length of embankments: 326 km	- Number of hydrometric stations: 205 - Number of hydro geological wells: 567 - Number of rainfall stations: 109 - Number of quality control divisions for river waters: 92 - Number of control divisions for flow drawing and restoring: 126

B. Arges River Basin

General data:
Arges river originates in the southern Carpathian mountain range and flows south-east into the Danube, over a course of 3,665 km.

Arges river basin has a surface area of 9,299 m^2 at hydrometrical station Budesti and an average multi-annual flow of 49.7 m^3/s. The total area of the Arges basin is 19,812 km^2, with a hydrographical length of 5,735 km. The average altitude is 392 m. Arges basin includes the followings counties (judets): Bucharest, Ilfov, Teleorman, Giurgiu, Arges, Dambovita (partially), Olt (partially). The population living in the Arges river basin is of about 3.6 million inhabitants.

The Arges Water Directorate is headquartered in Pitesti. The Directorate has six area divisions: four "Water Management Districts" in Arges, Giurgiu, Ilfov-Bucharest, Teleorman judets and two "Hydro-technical Units" managing major facilities in Vacaresti and Olt. The Directorate has 1,300 employees, out of which 203 work at headquarters.

The main polluters in the Agres River Basin are: a) industrial: extractive, petrochemical, mechanical engineering, agribusinesses; and b) municipal wastewater treatment plants. Main polluters are listed in Table 3, below.

Table 3 - Main polluters in the Arges River Basin

Type of industry	Factory
Chemical	ARPECHIM Pitesti
Oil extraction	Extraction site Titu; Extraction site Gaesti
Livestock	AVICOLA CREVEDIA (poultry); SUINTEST Calarasi (Piggery farm)
Other industries:	ACUMULATORUL Bucuresti; NEFERAL Bucuresti; Nuclear Engineering Institute Pitesti; DACIA Pitesti (car production); ARO Campulung Muscel (car production); Textile factory Balotesti
Municipal WWTPs	WWTP Pitesti; WWTP Campulung Muscel; WWTP Curtea de Arges

Assets
Main assets are mentioned in Table 4, below.

Table 4- Main assets of DAAV

Water resources	Multipurpose use storage lakes	Civil infrastructure for flood control	Integrated monitoring system
- Surface water: 1.741 million m^3 - Underground water: 833 million m^3	- Number: 50 - Total volume: 1.189 million m^3 - Wet volume: 894 million m^3	- Length of shore protection: 49 km - Length of river bed regularization: 320 km - Length of embankments: 218 km	- Number of hydrometric stations: 96 - Number of hydro geological wells: 367 - Number of rainfall stations: 60 - Number of quality control sections for river waters: 167 - Number of quality control monitoring stations for lakes: 57

II. Financial Data for Directorates

A. General considerations

This chapter describes the present situation of the two pilot River Basin Directorates (Siret and Arges), in terms of revenue, costs and pollution charges/penalties*.

In order to ensure consistency ROL values were converted to USD, given that the exchange rate evolved in a similar manner to the CPI (consumer price index) in the period under consideration. The exchange rates used for the ROL/USD exchange are yearly averages shown by the National Bank of Romania (www.bnr.ro) as shown in the table below:

Table 5 – Average annual rate of exchange, as published by Romanian National Bank

Year	2003	2002	2001	2000	1999	1998	1997	1996	1995	1994	1993
ROL/USD	33200	33055	29060	21692	15333	8875	7167	3082	2033	1655	760.01

The exchange rate for 2004 was assumed to be equal to the average rate for 2003.

* According to the new version of the Water Law, water tariffs and pollution charges will be called "contributions." The old name is preserved in this work, to emphasize that all data mentioned in the report are according to the old Water Law.

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B. Economic activities

Water supply and receipt of wastewater discharges are the main activities in terms of revenue generation. Revenues and costs pertaining to these two activities are analyzed separately below. Main activities and revenues they generate are shortly described below:

- Customers pay ANAR for water supply
- Customers pay ANAR charges for discharging wastewater into surface water
- Customers pay ANAR penalties for exceeding permitted water consumption volumes and pollution limits
- Fines for violating the Water Law are applied by the ANAR inspectors. Fines for violating the Environmental Protection Law are applied by the Environmental Protection Agencies. Commissars of the Environmental Guard apply fines for violations to both laws. Fines are paid to the state budget.

The procedure to set up and collect water tariffs and pollution charges consists of the following steps and levels of action: specifying water consumption and pollution limits through water permits; institutionalizing implementation of these limits and pertaining water tariffs and pollution charges through contracts; monitoring observance of the contractual covenants; invoicing and collecting tariffs for water consumption, pollution charges and penalties.
According to Art. 9 (1) of the Law 107/1996, the right to use water from surface or underground waters and to discharge wastewater in the "water resources" is granted through a water permit. Users using less than 0.2 liters/second, exclusively for household purposes, do not need a water permit, according to Art. 9 (2).
The water permit sets: a) the volumes of water that a user may take from surface and/or underground waters; b) the volumes of wastewaters discharged by the user; and c) the quality parameters of the wastewater (types of pollutants and max. allowable limits). The user is compelled to self monitor all the parameters specified in the permit. Monitoring results are reported to ANAR.

Users pay water tariffs based on the volumes of water used each month and pay pollution charges based on the concentrations of pollutants and on quantities of pollutants discharged in their wastewaters.
Users pay penalties in case they exceed the allowed limits in terms of water consumption and/or concentrations or quantities of discharged pollutants. The methodology to calculate penalties and of charging the services is set up by an order of the MEWM. The values of the penalties depend on the environmental impact of the pollutant. According to the New Water Law, penalties will be paid to ANAR.
In case users violate provisions of the Water Law, they are liable to pay fines. Fines are paid to the state budget.
Observance of these contractual provisions is certified monthly by a protocol whereby parties specify the used amount of water, the discharged volume of wastewater and the measured physical and chemical indicators, specified in the permit.

In excess of penalties and fines, according the Art.24(2) and (3) of Law 310/2004, in case of accidental pollution, expenses for: mitigating the effects of pollution; monitoring the evolution of the polluting wave; determining the type of pollutant; assessment of the pollution impacts will be recovered from the polluter.

Revenues from water supply
Water supply is the most important revenue making activity accounting for 63% (DAS), respectively 85% (DAAV) of the total revenue.

Sand and gravel account for 28% of DAS revenue, and only 3% of DAAV revenue.

Water quality related revenue is comparable: 9% for DAS and 12% for DAAV. Main sources for this type of revenue include: pollution charges, permitting fees, payments for conducting hydrological studies, laboratory tests, penalties for exceeding pollution limits.

Figures 2 and 3 below illustrate the evolution of the overall revenue as compared to water related revenue over a period of 10 years, beginning 1993.
Both Directorates experienced a steady increase in revenues in the last three years, reversing the previous four years' decreasing trend.
Figures 4 and 5 below illustrate the main sources of raw water and their specific contribution to the total revenue. DAS does not supply raw water from Danube. DAS' revenue is 2.3 times lower than DAAV's, for a 15% lower delivered volume. DAAV has an important revenue from supplying water for power generation.

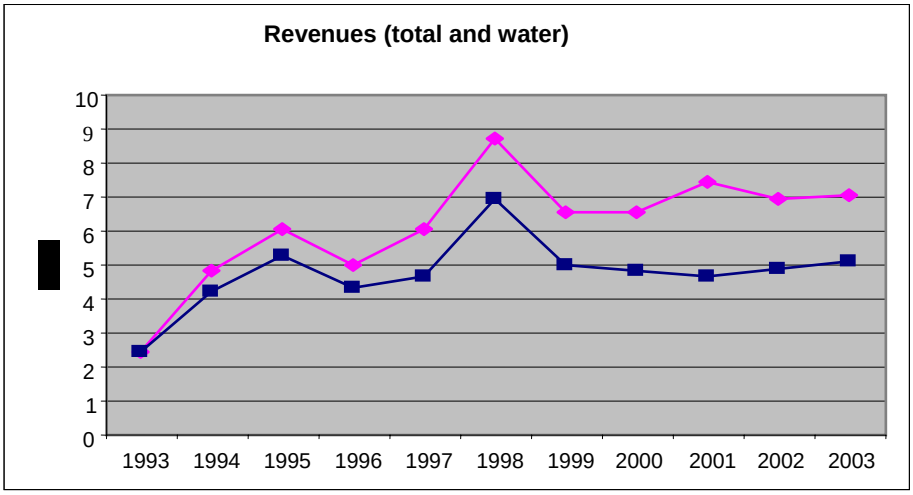

Figure 2 - Revenues evolution DAAV

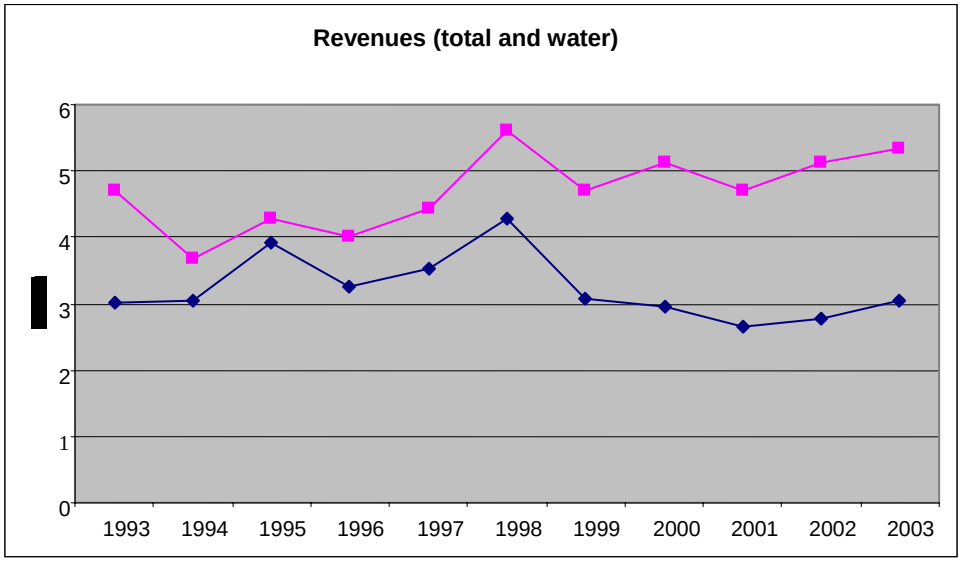

Figure 3- Revenues evolution DAS

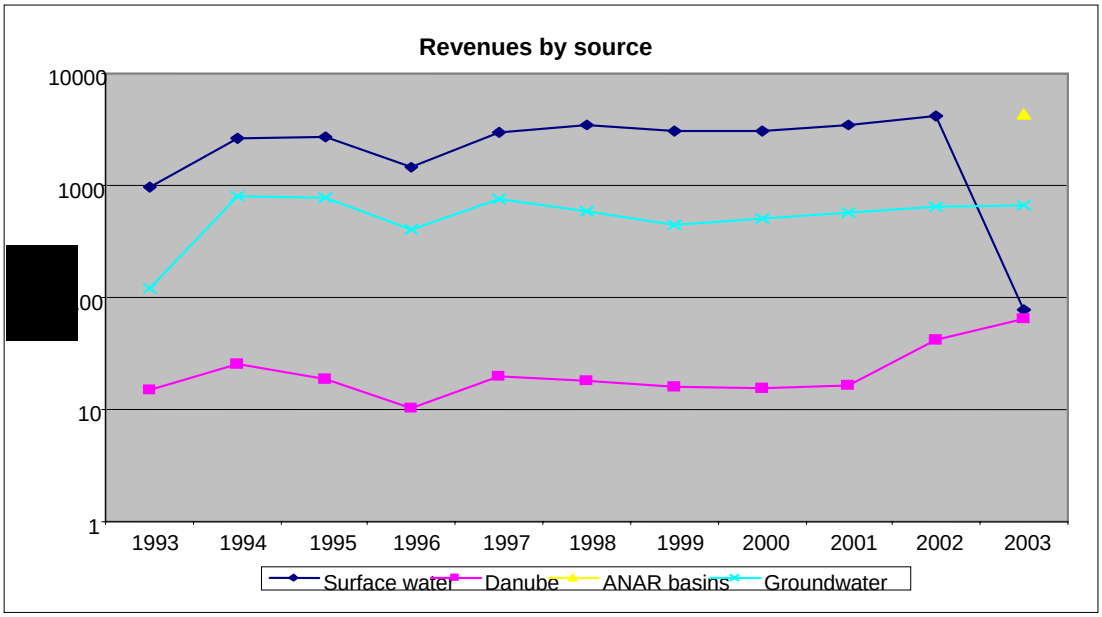

Figure 4 - Revenues by source of water for DAAV, in logarithmic scale

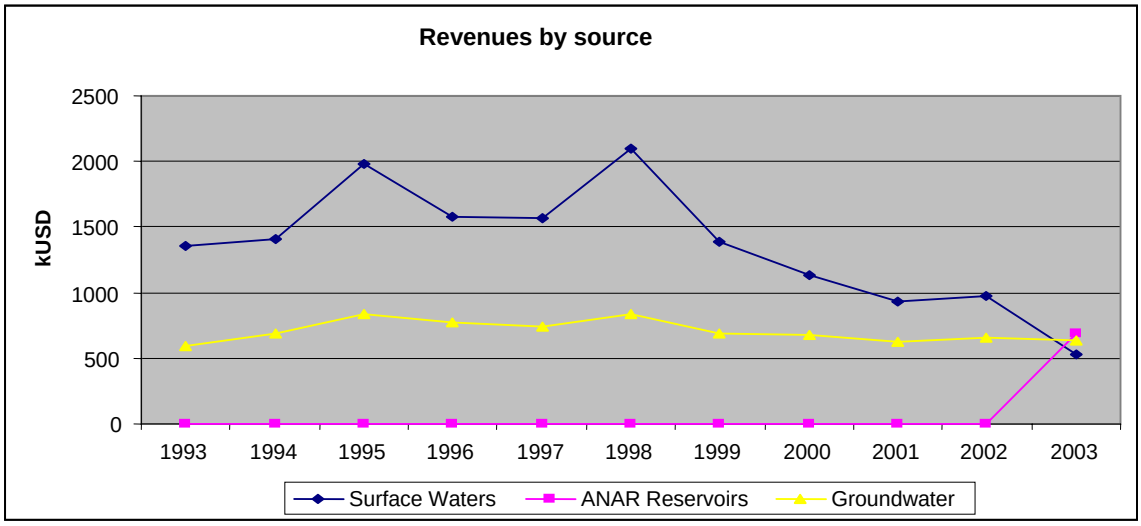

Figure 5- Revenues by source of water for DAS

Costs related to water supply

Figures 6 and 7 below summarize the structure of costs for the two directorates. It is obvious that the major cost is salary related. Material costs also include outsourced contracts, which seem low, as compared to the personnel cost.

Major infrastructure investments are financed by the state budget. Subsequently, depreciation for these investments is not included in the water tariff. ANAR also finances some investments from its own resources. Depreciation for these investments is included in water tariffs. Figures 8 and 9 below illustrate the level of overall investment values, financed by both the state budget and ANAR and the value of depreciation, as recovered through water tariffs.

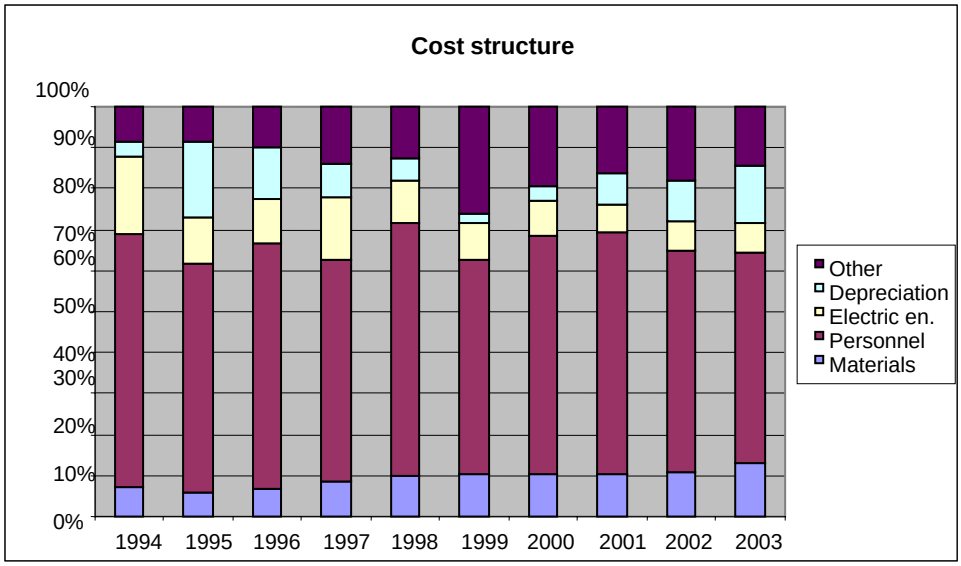

Figure 6- Cost structure DAS

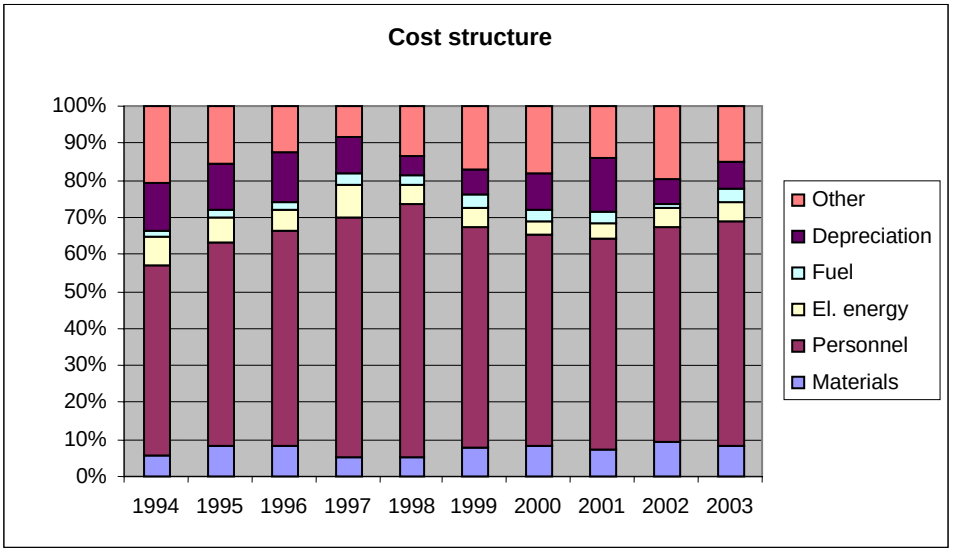

Figure 7 - Cost structure DAAV

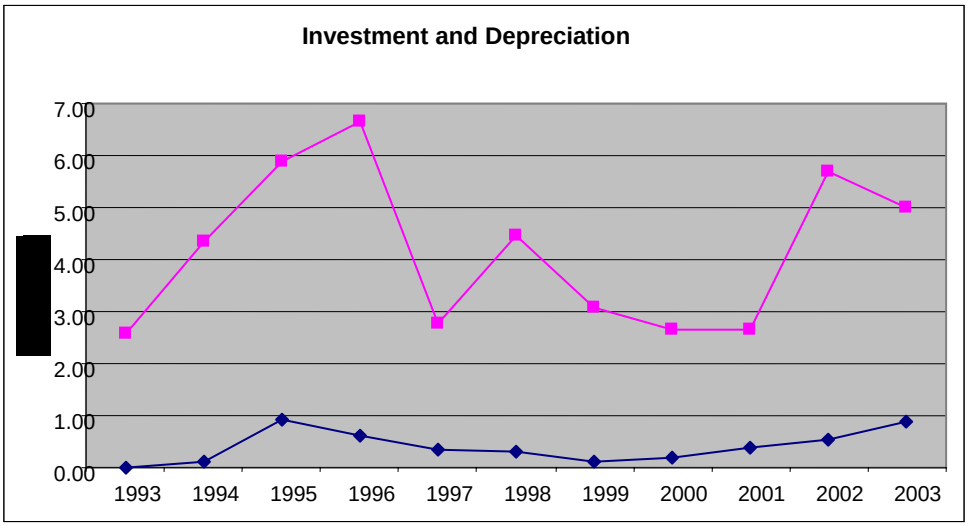

Figure 8. Investment and depreciation DAS

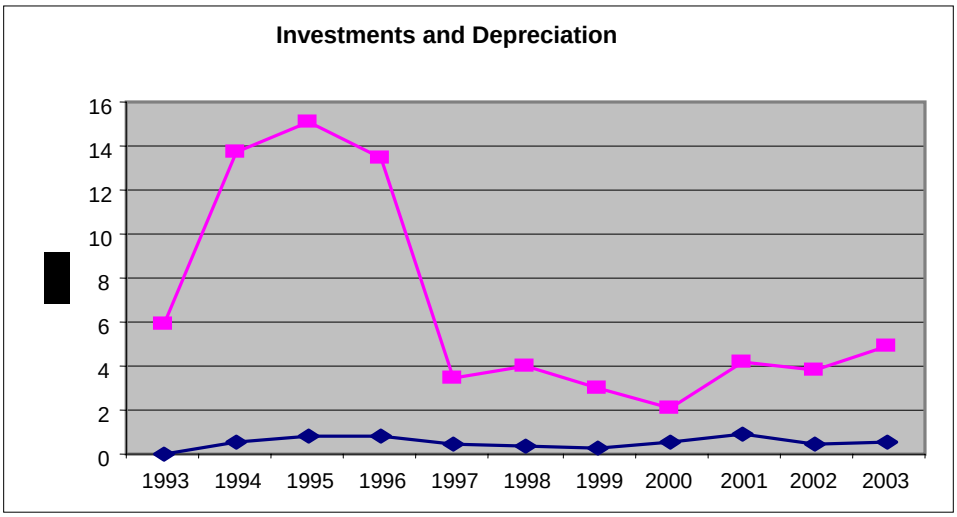

Figure 9. Investment and depreciation DAAV

Uncollected revenue is exposing ANAR to a lack of cash risk. Lack of cash is compensated either through barter type payments, called “compensations” or/and by taking loans. In both cases, the cost to ANAR is higher than the uncollected revenue. Exposure to this type of risk may be tackled, as a short/medium term measure, by including a risk (and insurance) component in the tariff such as to eliminate the “compensation” mechanism which represents unaccounted for currency in the economy.

DAS uncollected revenue oscillated, in the last ten years, from 20% to 31% of the billed annual revenue, as shown in Figure 10 below. With an average uncollected of 25.4% of billed revenue, one may define a risk component such as the cost of a bank loan to compensate for this lack of cash. Considering a 5% annual interest for a USD loan, in 2003 this cost would have amounted to 5% x 25.4% x 3,042 k USD = 39.15 k USD. In order to cover this cost, the tariff should have been increased by 1.2%.

Figure 11 shows the evolution of the uncollected for DAAV. Uncollected revenue drastically decreased after 2000, following concession of the Bucharest public water utility to Vivendi. Apa Nova, the new municipal water company, started promptly paying bills to ANAR. Since Apa Nova Bucharest is the largest water user in Arges River Basin, the effect is readily seen in the financial figures.

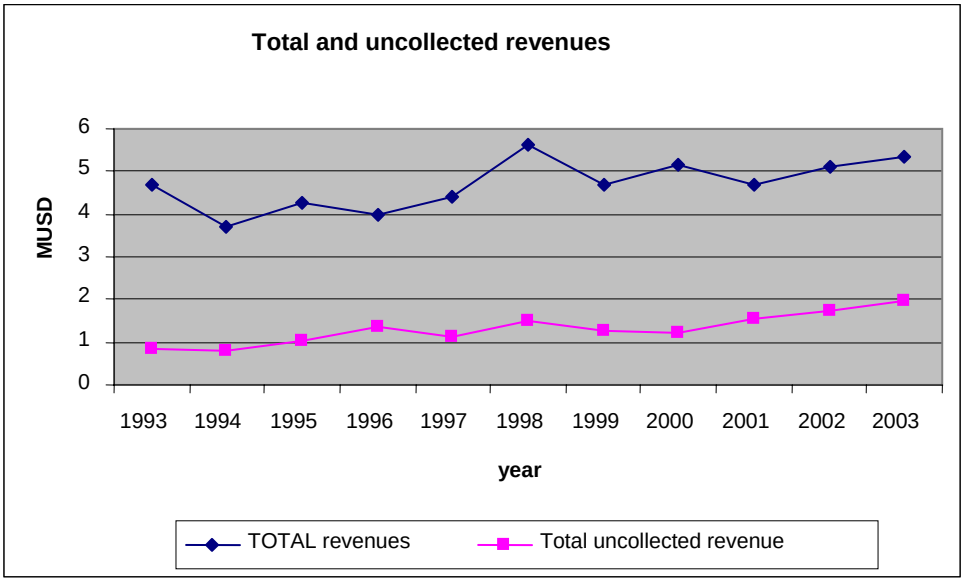

Figure 10 - Total and uncollected revenue DAS

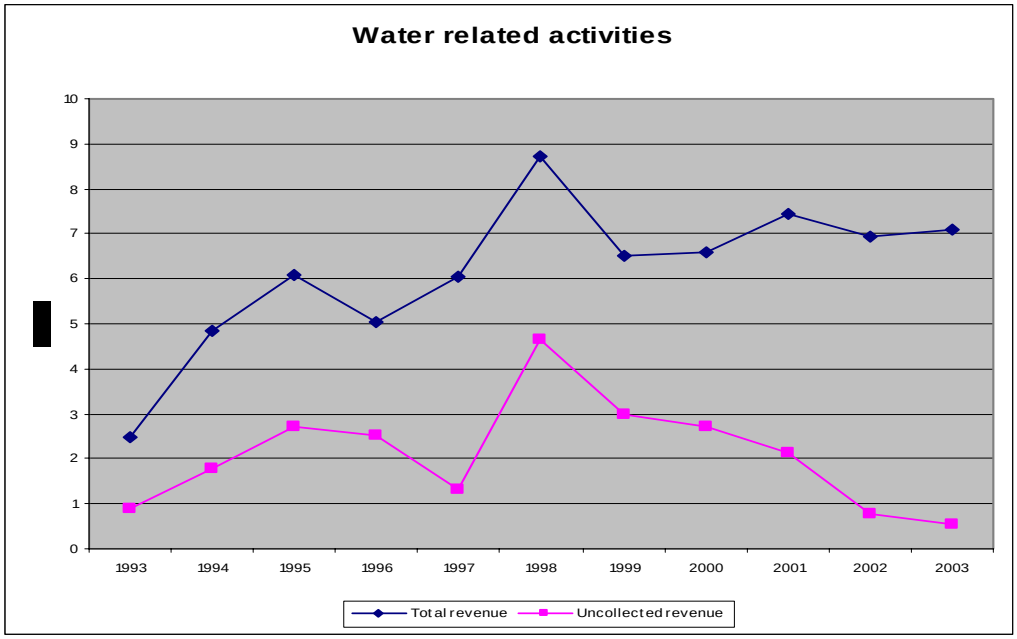

Figure 11 - Total and uncollected revenue DAAV

Profits

Profits are computed as the difference between revenues and costs. Figures 12 and 13 below show the dynamics of profits for the two Directorates over a period of ten years.

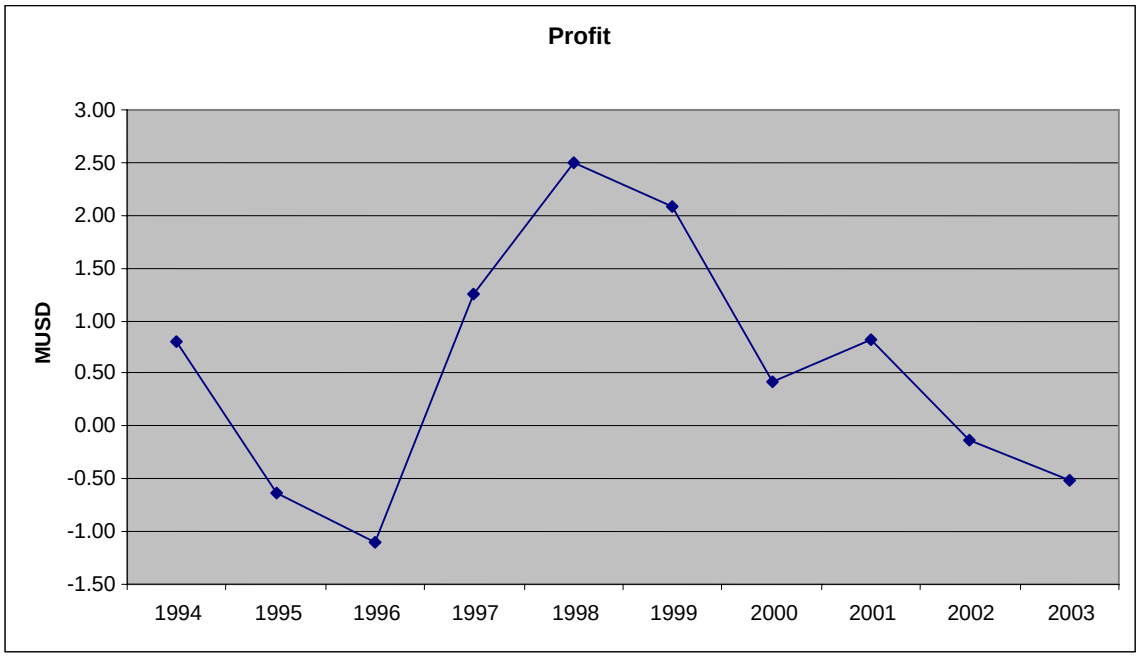

Figure 12 - Profit DAAV

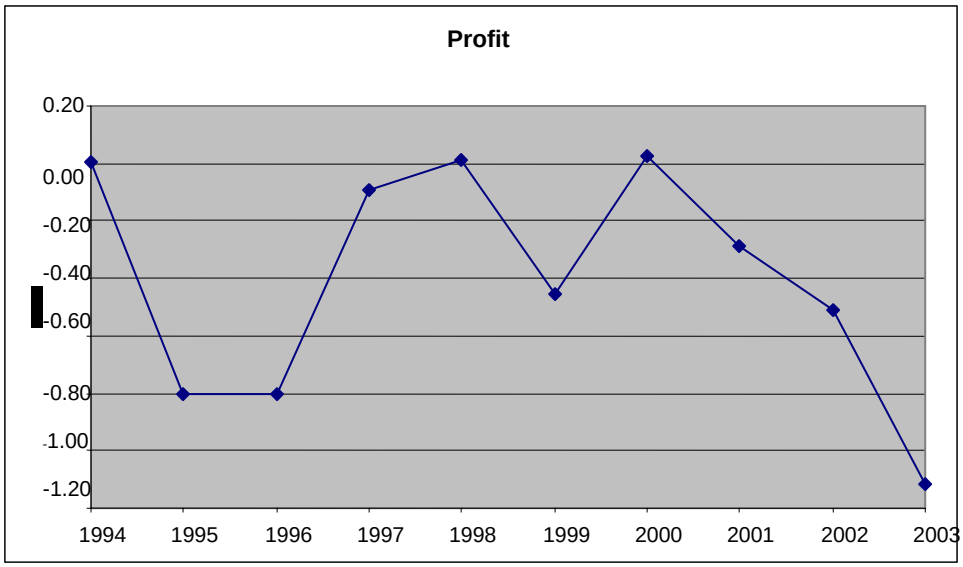

Figure 13 - Profit DAS

DAAV had positive profits in the period between 1996 - 2001, while DAS had positive profits only in 1998 and 2000. Profits decreased in the last three years, all in negative values. One explanation for this trend is maintenance backlog.

The difference in profits among the basin directorates suggests that the role of ANAR as a buffer to hedge for negative profit in some directorates should be analyzed in the context of the basins acquiring legal personality as per Law 310/2004.

Revenues from pollution charges/penalties
We represented in graphic formats the volumes of discharged wastewaters in different manners for the two river basins, in order to better show trends. Figure 14 show the discharged volume dynamics for different polluters, for DAAV. Figure 15 illustrates the ratio of untreated discharged wastewater in the overall discharged volume, for DAS. As shown by Figure 14, municipalities account for the largest part of the discharged wastewater volume. Figure 15 shows that the largest part of the wastewaters are discharged without prior pretreatment and that the ratio of untreated wastewater is increasing. Data received from pilot river basins show that industry treats 65% of its wastewater while public utilities only treat 11% of it. This is the combined result of pollution charges increases in the last years and of higher environmental enforcement pressure on privately owned industry than on public utilities. This situation leaves space for discussion regarding an environmental/opportunity cost component that will encourage implementation of municipal wastewater treatment plants in Romanian cities.
Both Figures 14 and 15 show that the amount of discharged wastewater is decreasing, just the same as water consumption.

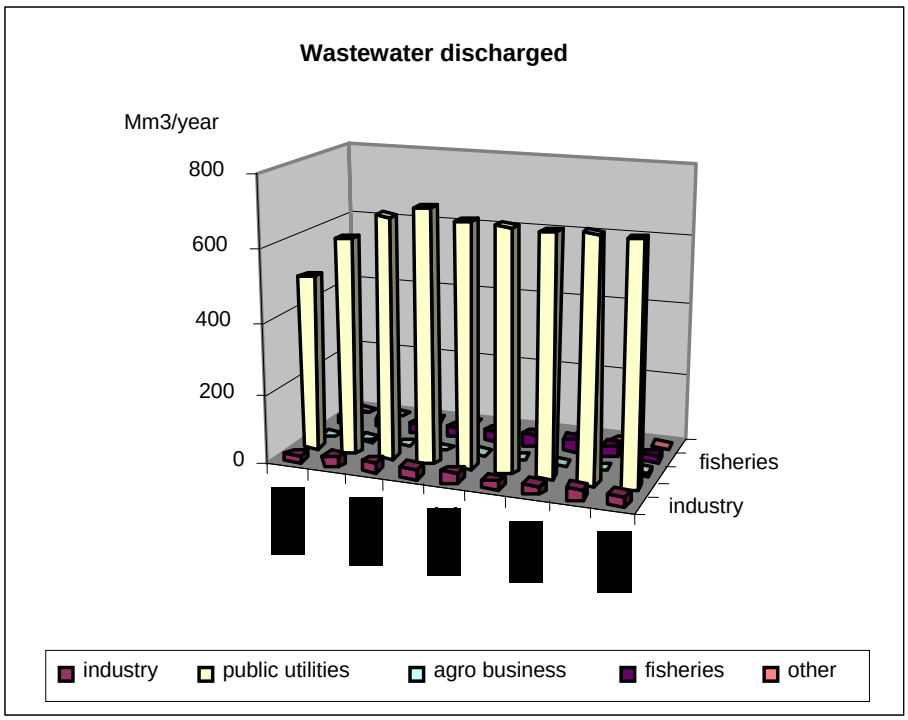

Figure 14. Wastewater discharged DAAV

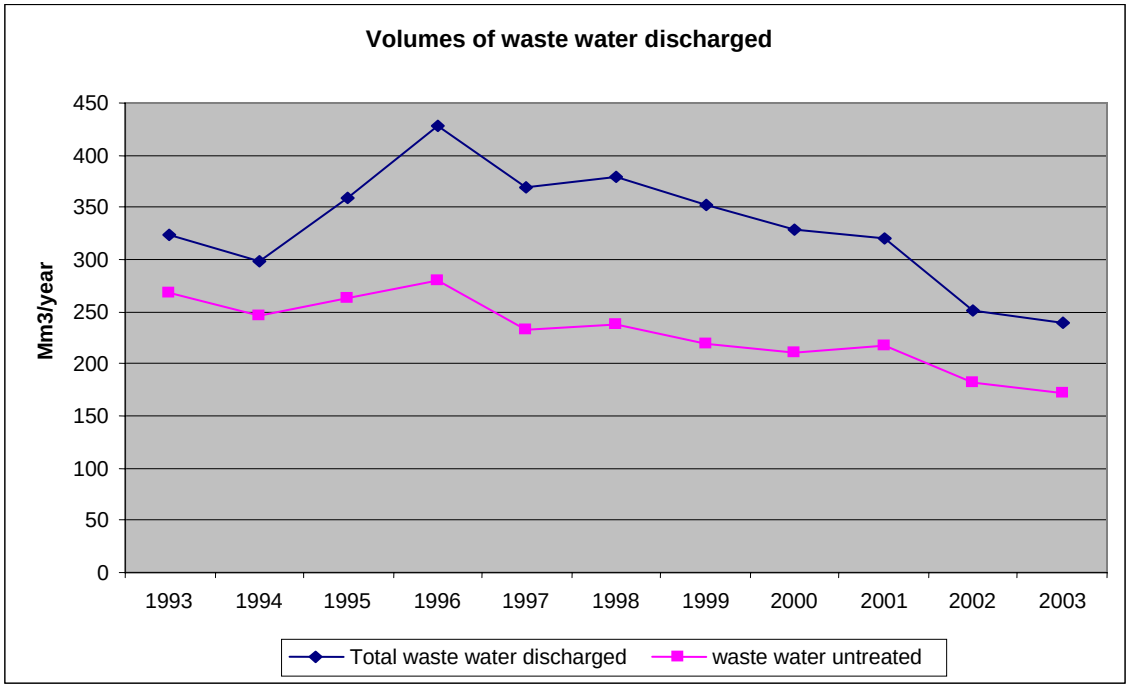

Figure 15. Wastewater discharged DAS

Figures 16 and 17 bellow show the dynamics of revenues from pollution charges over the periods for which data was available.

In the 1999 - 2002 period pollution charges expressed in USD increased 7 times as compared to 1993. DAS revenues increased sharply, while DAAV revenues did not increase at the same pace. One explanation for the difference may be that Apa Nova, in Bucharest reduced leaks in the water distribution system, which lead to decreased water consumption and subsequent wastewater discharge volumes[1]. Also, major industrial water users, such as Arpechim refinery in Pitesti, reduced water consumption and improved their wastewater treatment capabilities. Industries and municipal water utilities in DAS were either less concerned with

[1] In Romania, the volume of wastewater is calculated as 80% of the consumed volume of water.

water resource conservation, or did not have the financial means to implement water conservation measures, or both. Also, there is no private municipal water utility in DAS.

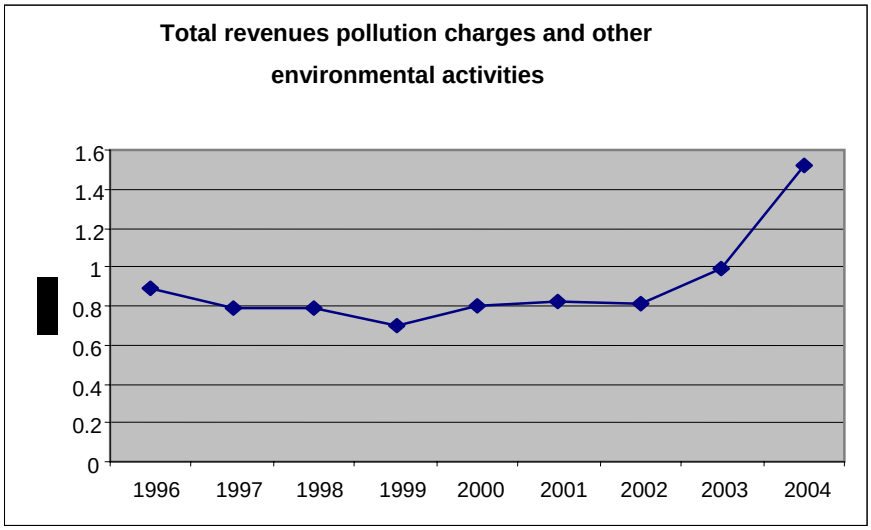

Figure 16. Total revenues from pollution charges DAAV

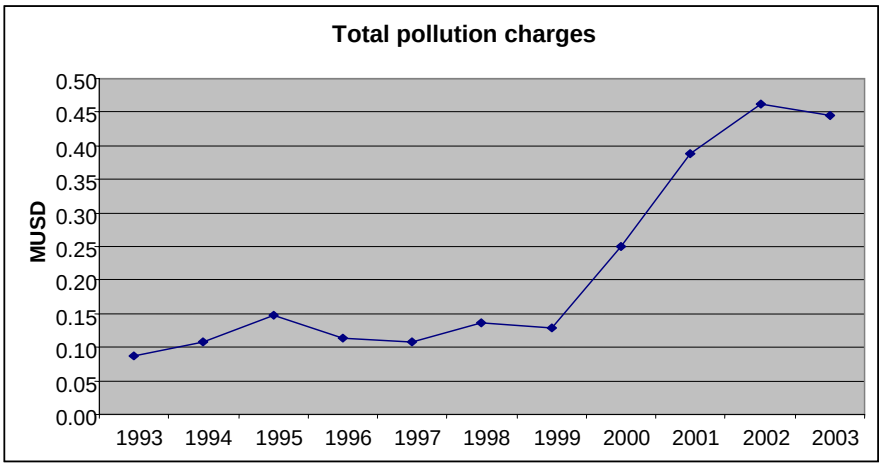

Figure 17. Total revenues from pollution charges DAS

Costs related to receiving wastewater services

Specific costs include: monitoring and emergency reaction costs. The cost of monitoring in 2003 in DAS was 0.365MUSD (12,109 MROL).

Investment costs in this case relate to purchasing monitoring and laboratory equipment. Such investments are financed from ANAR's own funds and depreciation is included in the overall depreciation of each Directorate.

There is no opportunity cost component in the pollution charge. The level of pollution charges and penalties should be set such as to motivate polluters to invest in pollution prevention activities.

ANNEX 2

Uncollected Revenues and Willingness/Ability to Pay

In this annex we demonstrate a simple and objective method to rate payers and to assess willingness to pay, based on readily available data provided by the two pilot Directorates.

I. Rating the payers

In a system of X,Y coordinates, we represented billed amounts on the X axis and uncollected amounts on the Y axis. If all bills were paid, all points of the line illustrating the relationship between the billed and uncollected amounts would be on X axis. If no bills were paid, all points of the line would lay on the first diagonal. In the first case, the value of the tangent of the slope angle of the regression line through the points would be 0, while in the second case it would be 1. We call "0" the "all collected" case and "1" the "fully uncollected" case. "0" is the best possible scenario and "1" is the worst case scenario.

The line showing partial uncollected situation would have a slope angle tangent value between 0 and 1. This way, a consistent method is defined to rate the willingness/ability to pay. The principle, applied to collecting water supply revenues, is illustrated in the Figure 1 for DAS and in Figure 2 for DAAV.

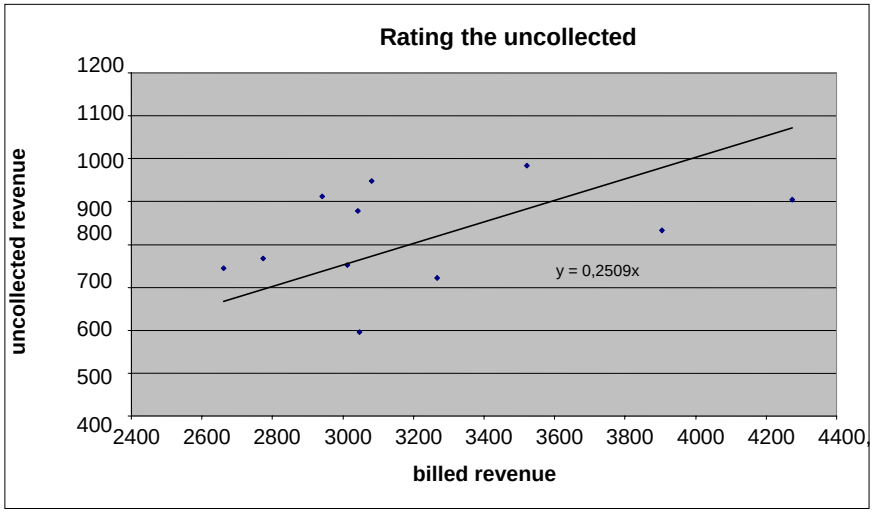

Figure 1-DAS data

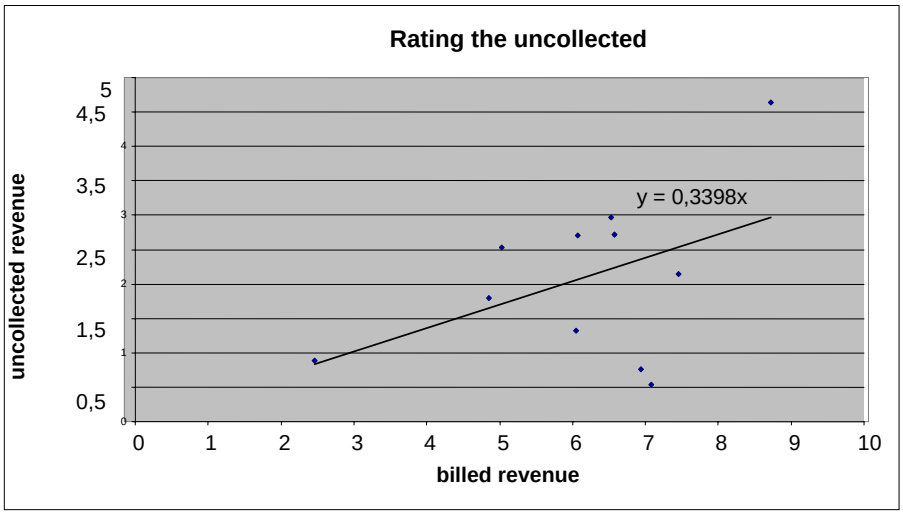

Figure 2-DAAV data

In Table 1 below we show the rating coefficients for DAS client categories, calculated based on the last 10 years reported data.

Table 1 - Rating coefficients for DAS water user categories

Client category	Rating
Power Generators hydro	0,188
Water Utilities	0,231
Agribusiness	0,236
Commerce, Industry, and Public Institutions	0,238
Irrigation and Fisheries	0,372
Power Generators thermal	0,517

The smaller the rating value, the better the client (0 rating means client paid all; 1 rating means client paid nothing). As may be seen above, hydro power generators are the best payers while thermal power ones are the worst; public utilities are better payers than commerce, industry and public institutions; agribusiness pay better than irrigation and fisheries.

II. Limits of behavior changing

Data provided on pollution charges revenue and relevant uncollected for DAAV and DAS allows for detecting limits of change in the willingness to pay behavior.

Figure 3 shows a rating coefficient of 0.2447 for DAAV pollution charges collection rate, comparable to the one for collecting revenues from water supply. We may conclude that the users' behavior vis-a-vis of not paying pollution charges is similar to the one of not paying for supplied water.

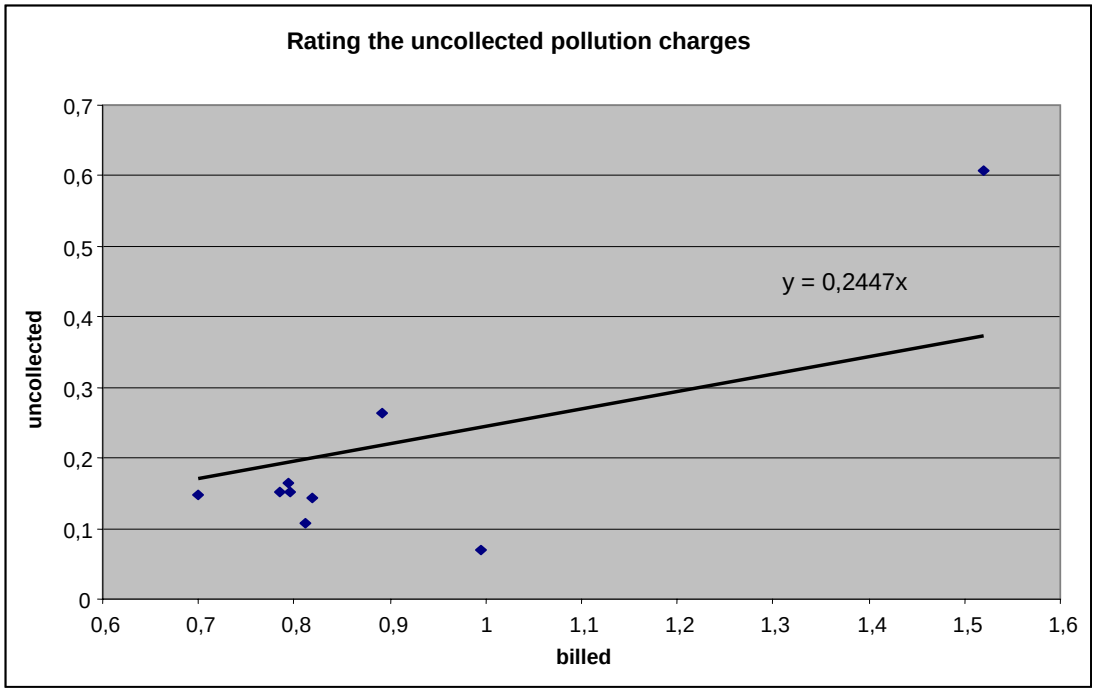

Figure 3-DAAV data

The type of rating implemented here is linear and results from the time behavior statistics.

The question related to future tariff increases is whether there is a limit of payment behavior of the clients beyond which the uncollected may grow drastically due to unwillingness/ inability to pay. This would be represented by a parabolic behavior first a downward then an upward trend after a minimum value (in other words a change in the first derivative sign).

A hint on the existence of a limit is given by the evolution of the uncollected percentage from pollution charge revenue versus the value of the pollution charge, in DAAV. Figure 4 shows such a change in behavior. First the value of the uncollected decreases with the increase in charge value, then it increases. Since there are several parameters involved the process (willingness, ability, collection measures by DAAV), we do not know the degree to which these parameters influence the change. For example, seeing an increase in the percentage of uncollected, DAAV may take stronger measures to collect and, the following year, the uncollected decreases, without a decrease in the willingness/ability to pay.

Plotting, for DAAV, the percentage of uncollected pollution charge revenue versus pollution charge per cubic meter of discharged wastewater, the change in behavior occurs over a value of 1.32 USD/1000 m^3.

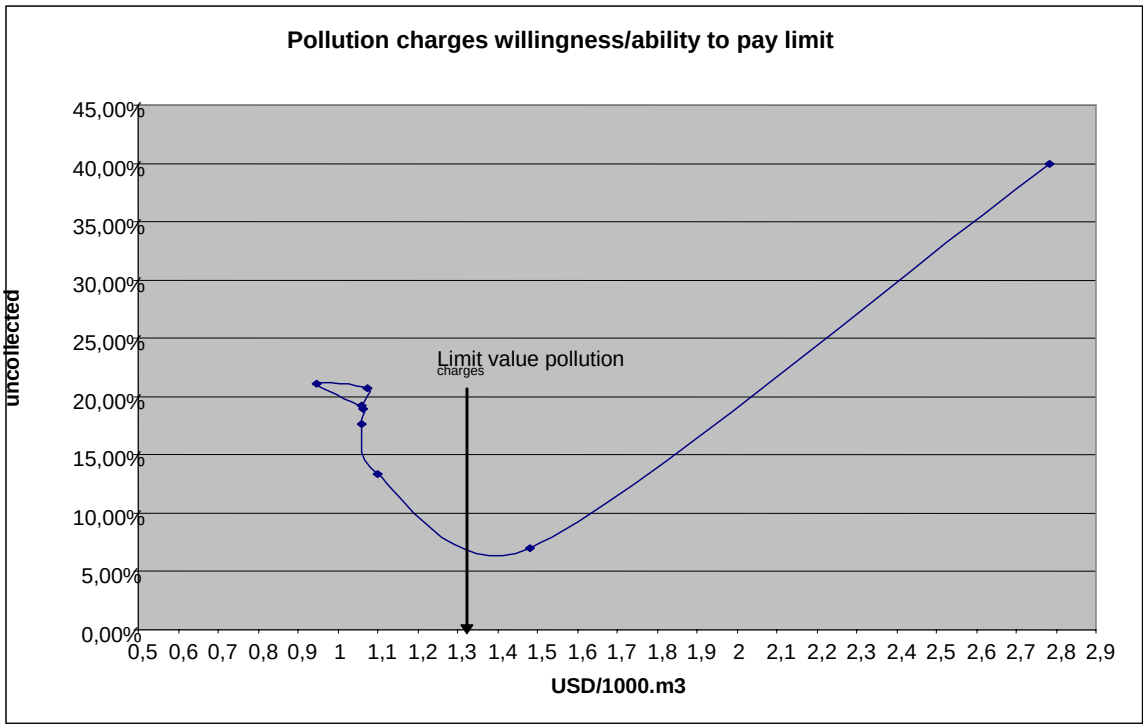

Figure 4 - DAAV data

To further sustain the above, we are presenting in Figure 5, the probability of collecting billed revenue for water supply, based on the DAS statistics, for the last 10 years.

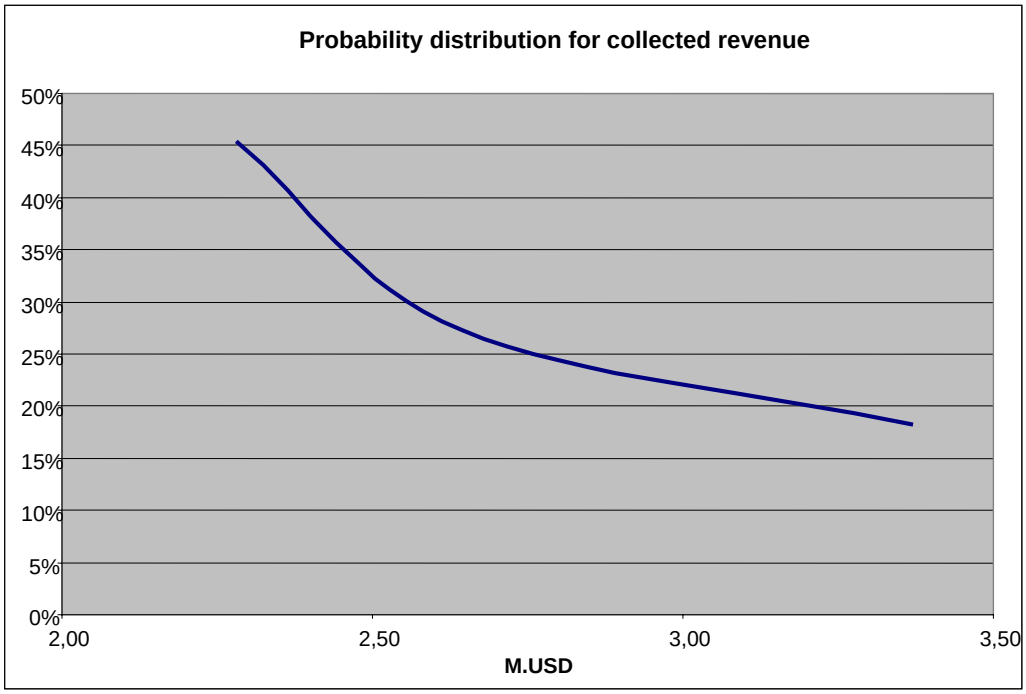

Figure 5-DAS data

Again, from the figure above it is seen that a limit value of the collected revenue exists beyond which the probability to collect is decreasing. Also, the asymptotic evolution of the curve, suggests that there is a minimum amount of billed revenue that will be collected any way.